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ABSTRACT

This annual volume is a compilation of professional articles and proceedings from a conference addressing timely issues in speech-language pathology and audiology. Featured articles include: (1) "Glottal Airflow: Instrumentation and Interpretation" (Christine M. Sapienza); (2) "Clinical Implications of Motor Speech Disorders in Elementary School-Age Children" (Judith C. L. Sutter and Michael A. Crary); (3) "Spanish Phonology: A Review of the Literature" (Alejandro Brice); (4) "Application of Various Production and Reception Measures to a Fluency Evaluation: A Case Report" (Dale F. Williams and Richard S. Saul); (5) "The Transparency of Amer-Ind Code" (Elizabeth A. Markman and others); (6) "Perspectives on the Future of Professional Training in Speech-Language Pathology: An Introduction" (Michael A. Crary); (7) "Professional Education in Communication Sciences and Disorders" (Malcolm R. McNeil); (8) "Report on a Consensus Conference in Medical Speech-Language Pathology" (Michael E. Groher); (9) "Present and Future Trends in Graduate Education" (Betsy P. Vinson); (10) "(Re)Training Practicing Clinicians: Clinical Education: Clinical Education/Clinical Competencies" (Michael A. Crary); and (11) "The Role and Practice of Clinical Specialty Recognition in the Future Training of Speech-Language Pathologists and Audiologists" (Leslie J. Gonzalez Rothi). (Articles contain references.) (CR)

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VOLUME 16, 1996

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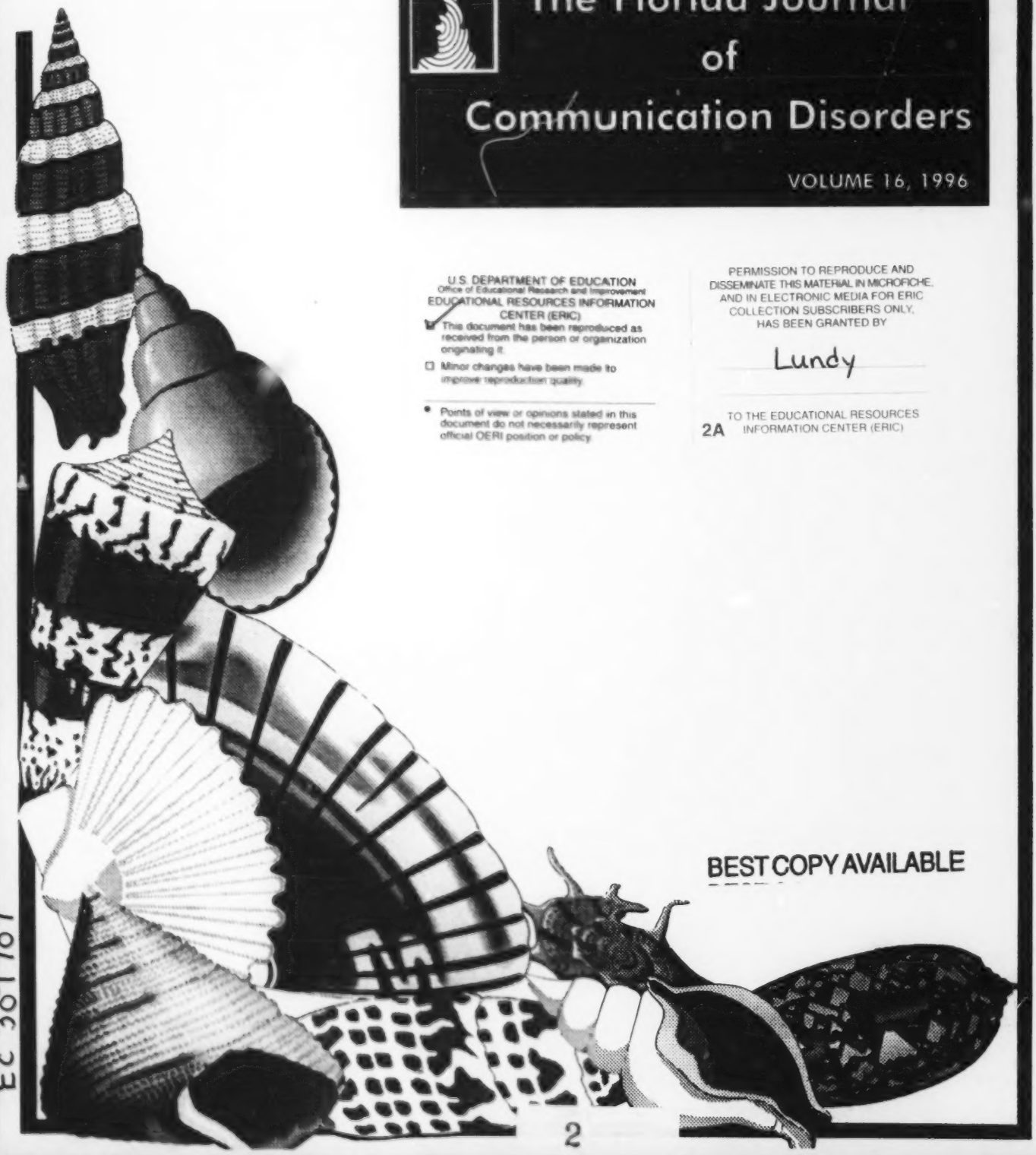

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FOREWARD

Volume 16 of the *Florida Journal of Communication Disorders* is a compilation of contemporary professional articles and proceedings from a conference addressing timely issues in speech-language pathology and audiology. The contents are pertinent, relevant and thought-provoking, and represent a variety of topics.

Dr. Christine Sapienza provides a tutorial on airflow instrumentation, use and interpretation for students and practicing clinicians alike. Drs. Judith Sutter and Michael Crary discuss developmental motor speech disorders, their evaluation and management, and the disruption of communication skills associated with this phenomenon. A review of the literature regarding Spanish phonology noting developmental, dialectical and phonological process errors identified across Mexican, Puerto Rican and Cuban speakers of Spanish is provided by Dr. Alejandro Brice. Both instrumental and non-instrumental measuring instruments are used by Drs. Williams and Saul to thoroughly evaluate a young adult male stutterer. The results and contributions of each respective measure to the evaluation and management process are discussed. How transparent are unilateral, bilateral and agglutinative gestures selected from Amer-Ind Code? Elizabeth Markman, Drs. Langhans, Guilford and Loeding, and Kelmie Hollahan address this and provide suggestions for future research. The proceedings on a conference entitled "Perspectives on the Future of Professional Training in Speech-Language Pathology" provide the reader with many thought-provoking professional considerations. In this age of changing technologies, health care reform and the multi-faceted workplace, the future of our professions becomes a challenging issue. Dr. Malcolm McNeil address professional education. Medical speech-language pathology is addressed by Dr. Michael Groher. Betsy Vinson shares her perspective on both present and future trends in graduate education. The educational and clinical competencies necessary to practice clinically and considerations for (re)training practicing clinicians are presented by Dr. Michael Crary. Finally, Dr. Leslie Gonzalez Rothi provides an overview on the role and practice of specialty recognition in the future preparation of speech-language pathologists and audiologists.

The Executive Board, Editorial Board and Editor truly hope the readership will find the contents of the *Florida Journal* relevant professionally. Speech-language pathologists, audiologists and related professionals are encouraged to contribute contemporary manuscripts addressing the study of human communication, swallowing and their disorders to the *Florida Journal.*

Joseph J. Langhans
Editor

Glottal Airflow: Instrumentation and Interpretation

Christine M. Sapienza
University of Florida
Gainesville, Florida

Uniformity, increased precision and increased accountability are a few of the beneficial characteristics of utilizing instrumentation in a voice clinic. This paper discusses aerodynamic analysis, specifically addressing the techniques of inverse filtering of the oral airflow signal. Aerodynamic analysis represents one technique used to quantify phonatory physiology. Analysis of glottal airflow waveforms derived from oral airflow signals is one method of achieving information regarding vocal fold dynamics during both normal and disordered voice production.

Instrumentation for measuring parameters related to voice production are currently available in research centers, major medical centers, and rehabilitation clinics in the United States. Utilizing instrumentation as part of a clinical protocol in the assessment of disordered voice provides a way to objectively measure certain phonatory parameters during speech. Specifically, objective measures can supplement perceptual judgments about the quality, pitch and loudness of the voice. Oftentimes, the results of instrumental assessment provide the clinician with information that the ear may not be sensitive enough to perceive. Uniformity, increased precision and increased accountability are a few of the beneficial characteristics of utilizing instrumentation in a voice clinic. By incorporating instrumentation into the assessment of voice, the clinician can formulate a standardized protocol that will produce quantitative measures of the degree of vocal impairment. For example, objective measures can be used to assess the status of the voice prior to intervention and compare that information to the status of the voice following an intervention program.

With the current emphasis on treatment outcome and treatment effectiveness, clinicians need a way to determine whether the treatment they provide assists in improving the phonatory characteristics of a dysfunctional voice. Since objective measures provide data relating to specific parameters of phonation, they allow clinicians to establish a baseline for comparison (Bless, 1991). Objective treatment outcome measures can be used to document whether phonosurgery, drug treatment or behavioral voice therapy improved phonatory function. Furthermore, a clinician can objectively document aspects of voice production that are not only impaired but also document aspects of the voice that are functional.

The intent of this paper is to address the use of aerodynamic analysis for the assessment of disordered voice, specifically the collection and interpretation of glottal airflow data. Analysis of glottal airflow is one aspect of aerodynamic assessment and represents only one of many procedures that are clinically available for examining phonatory physiology.

Airflow Measures

An educational background in instrumentation, at least a graduate course that focused on the concepts of calibration, signal transduction and experimental artifact, is certainly beneficial for effective collection of aerodynamic data. Once a clinician has gained the technical capabilities to adequately run the equipment, she/he is responsible for correctly interpreting the data provided by the instrumentation. Ability to collect data primarily requires technical training; accurate interpretation of aerodynamic data requires understanding the principles behind the techniques that are used to examine phonatory physiology.

Airflow data collection procedures are relatively simple to perform. The data collection phase is basically non-invasive. Because the equipment used is non-invasive, the patient can easily perform many types of speech tasks with little discomfort. This allows a variety of speaking and/or vocal tasks to be evaluated. Both young children and adults are able to complete the tasks asked of them with little difficulty. The amount of time it takes to collect aerodynamic data both within clinical and research settings will be dependent on the amount and type of speech tasks that are included in the assessment protocol. Typically, sustained vowel phonation, syllable repetition and reading are part of the assessment protocol.

The Equipment

A schematic of the instrumental set-up for collecting oral airflow is displayed in Figure 1. The manufacturer and price list for the equipment needed to collect airflow data and which has been used in the author's lab is in Appendix A. Rothenberg (1973) introduced the circumferentially vented pneumotachograph face mask, a system which allows oral airflow to be collected at the mouth. Oral airflow is often referred to as the oral volume velocity at the mouth (actually, the total airflow from the nose and the mouth). By placing the mask over the patient's nose and mouth, and ensuring an adequate seal between the mask and the face, the oral volume velocity waveform can be transduced. Oral airflow is transduced by coupling the mask to a high frequency pressure transducer (0-3kHz). The transduction system works on the principle of imposition of an impedance to produce a measurable pressure drop proportional to airflow (Baken, 1987). The impedance is a wire cloth screen, made of a layer of fine-mesh stainless steel, built into the mask.

In order to obtain a useful estimate of the vibratory pattern of the vocal folds, in-

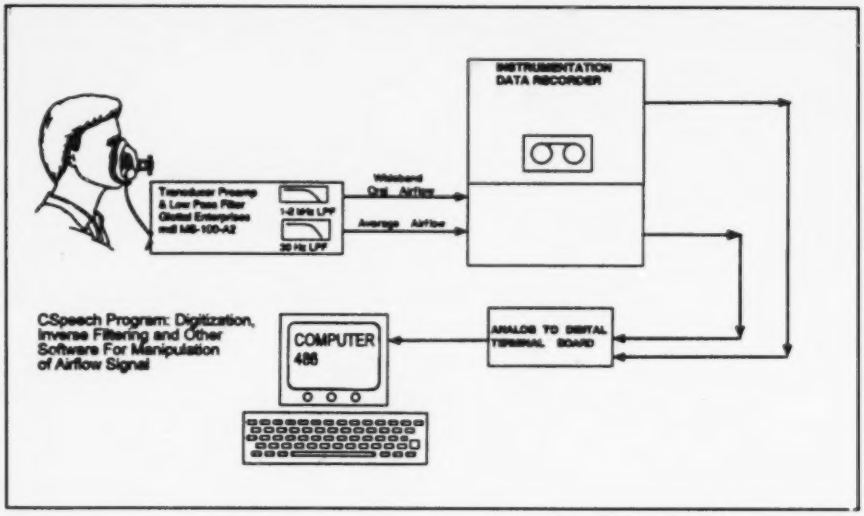

Figure 1. Equipment schematic depicting instrumental set-up for collection of oral airflow.

verse filtering must be performed on the oral airflow waveform. Inverse filtering is a process that was described by Rothenberg (1973) which calculates the spectral components of the oral airflow signal. Once the formant properties have been identified, the inverse filtering process removes those characteristics from the signal. After inverse filtering the oral airflow waveform, an estimate of glottal airflow can be obtained.

If the output of the pneumotachograph is to be used to eventually derive information regarding glottal airflow, several criteria must be satisfied (Rothenberg, 1973). First, the output must be a linear function of the volume velocity. Second, the airflow resistance of the mask should be so low that there is negligible disturbance of the pressures and airflow during speech. Adhering to the low airflow resistance criteria ensures that there is little distortion of the radiated acoustic signal. Third, the response time of the pneumotachograph should be small compared to the glottal period. The mask system has been shown to yield an oral volume velocity waveform sufficient for inverse filtering up to approximately 1 to 2 kHz (Rothenberg, 1989).

In order to get an estimate of glottal airflow or the airflow that is modulated at the level of the larynx, the inverse filtering procedure must be applied to the *oral airflow* output during vowel production. This filtering procedure can be completed either using an analog or digital technique. Both the analog and digital techniques rely on identifying the formant frequencies of the vowel of interest and appropriately removing them from the signal. Digital procedures to inverse filter the oral airflow waveform are commercially available using software programs. One in particular that has been developed and is widely used in the speech science research community is *CSpeech*, version 4.0 (Milenkovic, 1992). When using the inverse filtering algorithm that is provided by *CSpeech*, formant frequencies are identified using a linear predictive coding (LPC) method. LPC calculates the formant frequencies, computes the glottal derivative and re-integrates the signal to produce an estimate of glottal airflow. The frequency and bandwidth parameters are automatically adjusted for each voice production that is analyzed. This adjustment minimizes the residual formant energy regardless of the frequency and intensity of the signal (Stathopoulos & Sapienza, 1993). An oral airflow waveform and estimated glottal airflow waveform obtained after applying the digital inverse filtering algorithm are shown in Figure 2.

Speech Tasks

The vowels [a] or [ae] are typically used as stimuli, whether in isolation, within a syllable repetition ([papapapapapapa]), within a word ([papa]), or embedded within words produced during the reading of a passage. The low vowels [a] or [ae] are used because the ratio of the fundamental frequency (F_o) to F1 is large, thereby offering a clearer identification of the spectrum of the vowel for subsequent LPC analysis. Variations of these tasks can be designed as long as the vowel segment can be isolated and the resulting segment is long enough in duration to ensure an adequate sampling window (approximately 100 msec). During certain types of speech tasks the patient can be asked to manipulate the pitch and loudness of the voice. By having the patient change the pitch and loudness of their voice, a clinician can assess how the glottal airflow waveform is modified with differing degrees of laryngeal tension and laryngeal resistance.

From the glottal airflow waveform many different measures can be made. The more common measures that can be obtained from the glottal airflow waveform are listed below. A description of the significance of each measure in the clinical evaluation of voice is also provided. Notably, normative glottal airflow data for voice production in adults and children have been collected over the last twenty years. The data that are derived from patients with disordered voice must be compared to a standard or to a control, which is typically the voice production of someone without vocal pathology.

Measurements

When examining a sustained vowel production, the mid-portion of the vowel segment (approximately 1 second of duration) is often used for extracting the measures. During syllable repetition, the middle four vowel segments of a syllable train, consisting typically of seven repetitions, are typically selected for measurement (approximately a 100 msec window of analysis per vowel segment). For words embedded in sentences the mid-portion of the vowel segment is often analyzed, but note that the window of analysis is usually shorter because the speaking rate is typically faster.

Measures Extracted from the Glottal Airflow Waveform

Airflow Open Quotient. For the measurement of open quotient from a glottal airflow waveform, measurement criteria have been established by many researchers (Colton, 1989; Higgins & Saxman, 1989; Holmberg, Hillman & Perkell, 1988). These criteria are used to establish the beginning of glottal opening and the end of glottal opening. Employing a measurement criterion avoids the use of subjective definitions in establishing these time points. A criterion which is 20% of the AC amplitude of the glottal waveform has been used by Stathopoulos & Sapienza (1993a, 1993b)

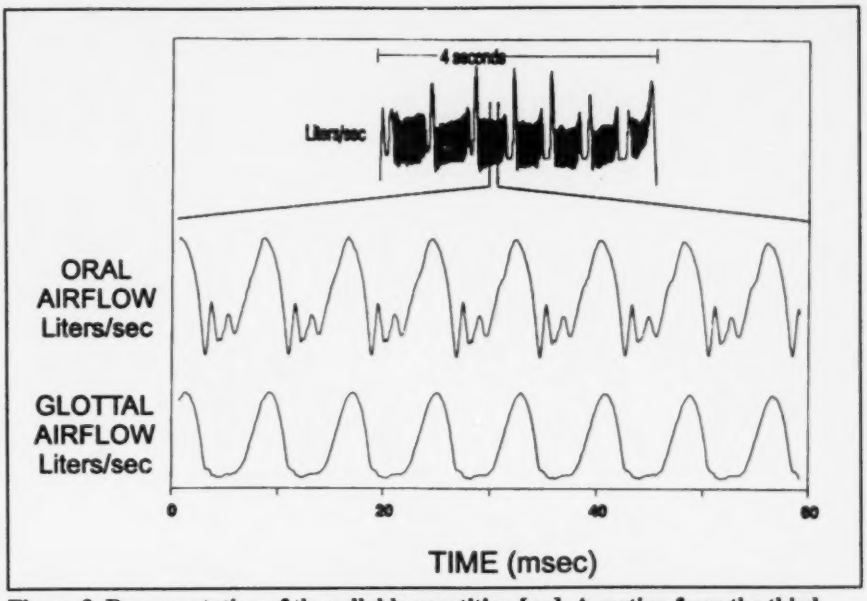

Figure 2. Representation of the syllable repetition [pa]. A section from the third vowel segment is expanded depicting an oral airflow waveform and glottal airflow waveform following the inverse filtering procedure.

and Sapienza & Stathopoulos (1995).

If applying a 20% criterion, open quotient (OQ20%) can be defined as the time airflow during the glottal cycle is greater than 20% of the AC component (AC = peak flow minus minimum flow) of the glottal airflow waveform (Y-W) divided by the period of the glottal cycle (W-W') (see Figure 3). Clinically, this measure provides durational information about the length of time the glottis is open relative to the duration of the entire cycle of vocal fold vibration. Since glottal opening allows flow to occur, this measure is useful for cases in which glottal closure is deemed inadequate or incomplete (hypofunctional vocal pathologies) or in cases where a high glottal resistance is suspected (obstruction, spasm, hyperfunction, or loud voice production). Open quotient is one measure that can help define the degree of glottal adduction during voice production, an important factor used to monitor the outcome of phonosurgery.

In general, the quality of the voice will vary with the shape of the airflow waveform. Examining the time that the glottis is open is one way in which waveform shape can be interpreted. The measure of open quotient during the course of intervention could be directed at maximizing the glottal closure for either longer or shorter durations depending on the voice quality judged to be appropriate by the clinician.

Maximum Flow Declination Rate. Maximum flow declination rate (MFDR) can be obtained by differentiating the glottal airflow signal. A differentiated airflow waveform is depicted at the bottom of Figure 3. MFDR is defined as the largest negative peak of the differentiated airflow waveform. MDFR provides information regarding the rate at which the glottal airflow shuts off. Holmberg et al (1988) defined MFDR as an index of the abrupt cessation of airflow at the moment of glottal closure. Sundberg and Gauffin (1979) and Gauffin and Sundberg (1989) found a strong correlation between the rate of airflow shutoff and the sound pressure level of the voice (see Scherer, 1991 for an excellent overview of the relationship between the physiological signal and the mechanics of phonation). The rate at which glottal airflow shuts off changes the airflow waveform shape. The motion of the vocal folds has to be altered to change the rate of airflow shutoff. Consequently there will be perceptual differences in vocal quality, specifically loudness, that result from alterations in the rate of glottal airflow shutoff.

Assuming no compensatory strategies exist, a case of vocal fold paresis would predictably yield a low MFDR value because of the inability to completely close the glottis and the slowness in the return of the weakened vocal fold towards midline. The result would be a breathy voice that is low in over-

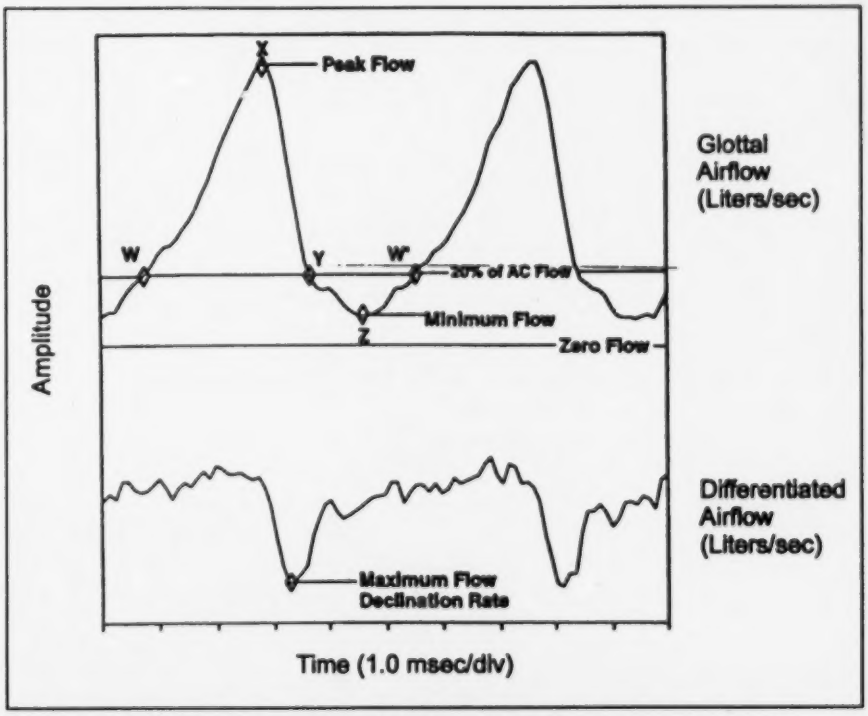

Figure 3. Glottal airflow waveform showing points related to peak (point X), alternating (X-Z), and minimum airflow (point Z), airflow open quotient (Y-W/W'-W). Bottom waveform of the Figure depicts maximum flow declination rate (MFDR) defined from a differentiated glottal airflow waveform.

all sound pressure level. In general, the faster the rate of glottal airflow shutoff (i.e., the steeper the waveform) the greater the loudness of the voice (Fant & Lin, 1988; Monsen & Engebretson, 1977).

Peak Glottal Airflow. Peak glottal airflow is defined as the maximum rate of airflow during the vibratory cycle and is represented as point (X) on Figure 3. Peak glottal airflow relates to the maximum glottal area during vocal fold vibration. Increased stiffness, decreased mucosal wave, or any other pathological condition which restricts the maximum displacement of the vocal folds during vibration can alter the peak flow during phonation.

Alternating Glottal Airflow. Alternating glottal airflow is defined as the amount of airflow from the maximum peak to the minimum valley (X-Z) of the glottal airflow waveform and represents that airflow which is modulated by the vocal folds during voicing (Figure 3). Alternating glottal airflow is affected in a similar manner as peak airflow in the presence of vocal pathology. Vocal fold tension and stiffness can alter the displacement of the vocal folds during phonation. The result is a change in alternating glottal airflow. In cases of contact ulcers, vocal nodules, and polyps, Hillman et al (1989) found an increase in alternating glottal airflow which was believed to be due to decreased tension and stiffness of the affected vocal fold that resulted in an increased amplitude of vocal fold vibration.

Minimum Glottal Airflow. Minimum glottal airflow is calculated from zero flow to the minimum of the AC amplitude of the glottal airflow waveform. It represents the amount of airflow present during the closed portion of the glottal cycle (See Figure 3 - point Z). Ideally, if the glottis was completely closed during phonation, minimum flow would be zero. However, even in individuals with normal voice, minimum flow is rarely zero (Holmberg, Hillman & Perkell, 1988). Theoretically, the higher the minimum airflow value the more incomplete the glottal closure. This measure provides an excellent way to document hypofunctional voice pathologies such as vocal fold paralysis.

Although minimum flow can be an excellent measure for quantifying the degree of glottal closure, one must be cautioned that it can be influenced by experimental artifact, such as pressure transducer drift from zero baseline. Baseline drift of a pressure transducer could be due to such things as a quick temperature change in the recording environment or to an inadequate mask seal to the patient's face. An inadequate seal between the patient's face and the mask can result in "airflow leakage." Thus, the minimum airflow value could be reduced as a result of an inadequate mask seal rather than as a result of disordered phonatory physiology. Some methods to ensure an adequate seal to the patient's face and to avoid drift in the pressure transducer follow. In order to account for possible pressure transducer drift, it is recommended that the pneumotachograph mask be removed from the patient's face a minimum of three times during the recording, at the beginning, middle, and end of the experiment. These "mask-off" conditions can be used during data analysis to recalibrate the transducer's electronic offset from baseline zero. On-line observation and measurement of the inverse-filtered airflow waveforms is also recommended to allow the clinician to monitor the patient's airflow values during each production and notice any extreme intrasubject variability in minimum glottal airflow across the tasks produced. Finally, if a negative minimum airflow value for the speech sample is produced, the trial number should be noted and excluded from data analysis. We have noticed with our system (Glottal Enterprises, Syracuse, NY) that the minimum airflow value can become negative with an inadequate mask seal. The reason that a negative airflow value sometimes results with a mask leak is a function of the Glottal Enterprises Transducer/Amplifier system. A negative voltage results from the DC shift dial on the Glottal Enterprises preamplifier which simply adds a DC voltage between -5 and +5 to the output signal. The intent of the system is to yield a result as close as possible to zero. Typically, however, there is a small residual voltage to either side of zero, and, consequently, there are times when the airflow value actually becomes negative, even while a person is phonating on expiration.

Minimum Glottal Airflow/Peak Glottal Airflow. The ratio of minimum glottal airflow to peak glottal airflow represents the percentage of "glottal airflow leakage" relative to the entire airflow amplitude and has been shown to have a high correlation to degree of breathiness (Fritzell, Hammarberg, Gauffin, Karlsson & Sundberg, 1986). A value of "zero" would theoretically indicate no glottal airflow leak and no perceptible breathiness during voicing.

Average Airflow Measures

An average oral airflow signal can also be used clinically but provides less information regarding vocal fold vibration than does the glottal airflow signal. Average airflow is obtained by collecting oral airflow but is filtered differently. Typically, the oral airflow signal is low passed filtered at 30Hz. Although average airflow data have been shown to be useful in documenting voice change post phonosurgery (Hirano, 1981), if extracted during speech tasks other than a vowel prolongation, it not only represents laryngeal airflow but that airflow modulated by other articulators within the oro-nasal-pharyngeal cavities. Therefore, exclusive use of average airflow data may limit interpretation of laryngeal physiology as related to phonatory dysfunction.

Summary

The use of instrumentation as part of a clinical protocol for evaluating voice can be used to objectively quantify voice characteristics. Aerodynamic analysis is one method for examining phonatory physiology. Glottal airflow analysis, a specific non-invasive aerodynamic technique, can provide information on vocal fold function. The intent of this paper was not to give an exhaustive review of the theory behind glottal airflow analysis; rather it was intended to provide an overview of the basic type of measures that can be utilized in a clinical setting. Additionally, a brief description of how glottal airflow measures can contribute to the assessment of dysfunctional voice was provided.

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APPENDIX A

Equipment Price List
Glottal Enterprises

719 East Genesse Street, Syracuse, New York 13210
Phone: (315) 424-1780 • FAX: (315) 478-6902

Circumferentially Vented Pneumotachograph Face Mask $220.00

Circumferentially Vented Pneumotachograph Face Mask with separation for collection of oral and nasal airflow $300.00

Mask Handle $90.00

Wide-band Pressure Transducer (necessary for inverse filtering) $490.00

Low-frequency Pressure Transducer - used for collection of average airflow signal $380.00

Additional items which are necessary include instrumentation for data storage. A PCM data recorder that can record down to a DC signal is recommended. Approximate cost $4,000.00. Computer System and Digitizing Board approximate cost $3,000.00.

CSpeech is one software program that is commercially available for digital inverse filtering. CSpeech Laboratory Automation Software Program approximate cost $995.00.

If additional information is needed, please feel free to contact the first author at FAX: (904) 392-6170.

Clinical Implications of Motor Speech Disorders in Elementary School-Age Children

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Children with developmental motor speech disorders struggle to acquire speech and language skills, especially during the preschool years. But what happens when these children reach school-entry age and significantly new demands are placed on their communication systems? Skills in reading, writing, and conversational competencies now begin to emerge. In this paper, a range of communication skills were assessed in three school-age children, ranging in age from 8:2 to 9:7 years, who had previously been diagnosed as apraxic. Motor speech, non-speech movements, articulation, prosody, semantic, syntactic, reading, and conversational competencies were assessed. Deficits in reading and conversational competencies were shown to be the predominant communication problems in these three school-age boys who continue to exhibit residual signs of developmental motor speech disorder in oral language production. This leads us to conclude that dysfunctional motor speech programming cannot only disrupt linguistic-based skills at any age, but appears to have the potential for disrupting many, if not all, communication skills.

The ability to acquire speech and language skills is severely compromised in children with developmental motor speech disorders. In an effort to improve speech intelligibility, considerable remedial resources are directed toward shaping phonological output of preschool children thought to have apraxia of speech. In a time past, developmental apraxia, as it was then so labeled, was conceptualized as "an inability to perform coordinated and complex oral movements during speech while maintaining the ability to normally execute oral volitional movements" (Morley, 1965). Morley referred to this problem as an articulation-based motoric disorder. More recently, Aram and Nation (1982) have taken the position that developmental verbal apraxia, as they have chosen to label apraxia of speech in childhood, was as much a language-based disorder as it was an articulation-based motor disorder. They argue that the etiology for both aspects of the same disorder coexist in a common underlying neurological process. In 1993, Crary observed that characteristics of developmental motor speech disorders (Crary's label for apraxia and dysarthria in childhood) do not reflect a unitary motoric/language function, as Aram and Nation had implied in their description of developmental verbal apraxia, but rather, are better described as a cluster of motor speech disorder symptoms in which speech and motor performance demonstrate "parallel deficits" (p. 25). Crary (1993) posited that "meaningful speech is a motor phenomenon" driven by "linguistic input" (p. 51). Advancing this argument to its logical conclusion, when in the presence of dysfunctional motor speech programming, all emerging speech and language skills may be subject to disruption. Therefore, it would seem reasonable to suggest that advanced language skills such as reading, writing, and conversational competency may be susceptible to disruption as they emerge in the communication repertoire of children with motor speech disorders.

Traditionally, speech and language profiles of preschool children with motor speech disorders have been characterized as including "multiple articulation errors, dysprosody, motoric struggle during speech, limited grammatical form, and spared comprehension of spoken language" (Crary, 1993). Remediation goals for these disorders in preschool children focus heavily on the motor deficit, largely promoting a "bottom-up" approach that emphasizes development of oral/verbal movement sequences, such as CV and VC sequences, and intensive, systematic articulatory drill exercises (Crary, 1993). While such intervention strategies may be appropriate for some types of developmental motor speech disorders, significant demands beyond that of oral language are placed upon the communication systems of elementary school children. Certainly, the academic environment significantly changes the focus of communication. However, current assessment strategies for school-age children with developmental motor speech disorders still primarily focus on motorically-based articulation ability and articulatory drill activities continue to be the avenue used to meet the goal of enhanced intelligibility in conversational speech. This causes us to question whether customary assessment and treatment strategies for school-age children with motor speech disorders are adequately meeting the communicative needs of these children.

In order to find answers to these inquiries, it was necessary to determine if school-age children do, in fact, present with a range of communication problems that include deficits in the later acquired skills of reading and conversational competency. Three children referred to our clinic were selected for evaluation based on the criterion of age (i.e., they were elementary school-aged children), and had previously been diagnosed as having apraxia of speech. Communication skills, including receptive and expressive levels of semantics and syntax, reading (word decoding and comprehension), and select conversational competencies were evaluated. Motor speech, non-speech oral performance, articulation, and prosodic parameters were also evaluated to confirm the diagnosis of developmental motor speech disorders. Clear evidence of reading and conversational skill deficits would support the hypothesis that developmental motor speech disorders have the potential for disrupting a range of emerging linguistically-based skills, regardless of age.

ASSESSMENT INSTRUMENTS

When evaluating a range of communication skills, selection of test instruments is not altogether easy. Selectivity in choosing standardized test instruments and creativity in developing criterion referenced tests for which standardized instruments have not

been developed is required. A list of the test instruments used to assess the non-speech, motor speech, and communicative performance of subjects are itemized in Table 1.

Communication and Developmental History

The three boys presented in this paper were 8:2 years, 8:7 years, and 9:7 years of age. They had all been diagnosed as presenting with apraxia and/or dysarthria during their preschool years. As reported by parents, the boys were "late talkers" and unintelligible for a considerable period during the preschool years. Each had received many years of speech therapy. Documentation from other professionals revealed that these school-aged children had undergone extensive testing during their lives. These reports indicated that attention deficits and/or weak auditory processing skills were common to these boys. Furthermore, each was labeled as learning disabled by the school system. Specifically, they were having more difficulties learning to read than they were having acquiring mathematical concepts. Family histories of speech and language problems were also quite pronounced in this group. General developmental and communication histories of the boys are summarized in Table 2.

Standardized Test Instruments		
Motor Speech	Fletcher's Time-By Count Test of Diadochokinetic Syllable Rate (1978)	
Phoneme Production	Goldman Fristoe Test of Articulation (1986)	
Semantic Development	Receptive One-Word Picture Vocabulary Test (Gardner, 1985) Expressive One-Word Picture Vocabulary Test-Revised (Gardner, 1990)	
	CELF-R	Formulated Sentences (1980) Word Classes Semantic Relationships
Syntax	CELF-R	Word Structure (1980) Sentence Structure
Reading	Diagnostic Reading Scales (Spache, 1981) Lindamood Auditory Conceptualization Test (1979)	
Criterion Referenced Test Instruments		
Non-Speech Performance	Oral and Hand Praxis (Crary, 1993)	
Phoneme Production	Phrases for assessing articulation performance load variables (Crary, 1993)	
Prosodic Parameters	Loudness Rating scale/descriptive analysis: too loud, normal, too soft Pitch Rating scale/descriptive analysis: too high, normal too low	
Conversational Competencies	Establishing a referent/reference for each utterance Gaining the speaker role in turn taking Asking for clarification or paraphrasing to verify understanding Asking for assistance in a manner that elicits cooperative interaction	

Table 1. Assessment tools used to evaluate a range of communication skills in school-age children with developmental motor speech disorders.

The case history has a central role in the assessment battery tailored to these children. Understanding how developmental motor speech disorders have been manifested over time is essential in ascertaining what impact this condition has had on the overall social and academic development of

Child CA.	Developmental History	Communication History	Family History	I.Q. Full Scale Quotients (Test & Date)	Attention Deficits (Medical Diagnosis)	School Grade
Boy #1. 8:2 yrs	Walked -12 mos. Birth History Evidence of hypoxia. Feeding No report.	-Late talker. -Early sentences did not emerge until 2:6 yrs	-Father-dyslexic. -Mother-Learning problems. -Sister-Attention deficit disorder.	-WPPSI 5/29/92 - 112 -StanfordBinet 4/29/94 - 104 -WISC-III 6/9/96 - 96	-Attention deficit hyperactive disorder. -Auditory processing speed deficits.	-3rdgrade.
Boy #2. 9:7 yrs	Walked not know. Birth History Normal Feeding No problems.	-Late talker. -Early sentences did not emerge before 2:6 yrs.	-Father-speech problems. -Brother-speech problems. -Both had therapy for articulation concerns.	-WISC-III 3/25/93 - 106	-Weak attending ability. -Short term auditory memory deficits. -Rise time needed to focus.	-3rd grade. -Retained one year
Boy #3. 8:9 yrs.	Walked -14 mos. Birth History Possible hypoxia. Twin died in utro. Feeding Sucking problems.	-Late talker. -No babbling until 15-18 mos. -Only few words at 24 mos.	-Father-stuttering. -Mother-history of speech problems on mother's side of family.	Kaufman Battery/Child 7/3/89 - 100 -MerrillPalmer 10/13/89 - 87 -StanfordBinet 5/15/91 - 105 -WPPSI-R 5/31/92 - 89	-Attention deficit disorder.	2nd grade. -Retained one year.

Table 2. General developmental and communication history in three school-age boys with motor speech disorders.

the child. Awareness of concomitant weaknesses in physical development, as well as aberrant psychological, social, and emotional behavior is important. Psychological and medical reports provided clear evidence that, for each boy, fine and gross motor development was retarded and a variety of neurological-cognitive deficits were present. Parental testimony indicated that the social behavior of the boys was somewhat immature. Not one of these boys had ever been able to establish close friendships with peers. They explained that fine and gross motor deficits had largely prevented their sons from playing most sports with any degree of skill. Although speculative, parents felt that these motor deficits had contributed to the difficulties their sons were having in establishing friendships, especially as sports often function as a bonding agent between boys.

Oral Motor Function

Following a routine examination of the oral mechanism, assessment of non-speech movements of the face and hands was conducted for each boy. The results of non-motor speech tasks are provided in Table 3. Oral-facial and hand praxis were evaluated using a criterion referenced test (Crary, 1993). Oral-facial movements included: (1) protruding the lips, (2) protruding the tongue, (3) opening the mouth, (4) lateralizing the tongue, (5) elevating the tongue, and (6) biting the lower lip. Hand movements included: (1) flattening the palm against the table, (2) making a fist, and (3) resting the hand on its edge, with the little finger touching the table. Photographs were used to elicit specific oral-facial or hand movements. Initially, single photographs of a movement category were presented to the boys. Imitation of single movements in either movement category was executed with relative ease by the boys. The task became stressful when these children were required to repeat a sequence of movements, either in a set of three identical movements or a set of two or three different movements. Groping or uncertainty in motor response and motor overflow (i.e., unspecified or unallocated extra movements) were noted. These aberrant motor responses suggest a lack of motoric control that characterizes non-speech neurological programming difficulties.

Motor Speech Evaluation

Upon initial contact with these school-age boys, deviations in articulation and prosodic features were immediately noticeable. The Fletcher Time-By-Count Test of Diadochokinetic Syllable Rate (1978) procedure was used to evaluate rate and fluidity of articulatory motion in motor-speech performance. Time-by-count age norms, diadochokinetic rates with a bite block and without a bite block are provided in Table 4. Boys in this study exhibited motor-speech performance rates that differed from their peers. A bite block was constructed from dental material according to Netsell's (1985) directions. With a bite block carefully placed between the upper and lower molars, each child repeated the diadochokinetic rate tasks. When a bite block was inserted to stabilize mandibular movement for Boy #1, speech production became noticeably slower and somewhat less articulate. Boy #2's motor-speech performance was not significantly changed by the bite block. However, for Boy #3, a significant decrease in mandibular bouncing was observed. Furthermore, tongue elevation was facilitated. The number of speech sound repetitions per breath was increased and a more even rate of speech sound production was noted. Pitch and loudness levels were more appropriate. Boy #3 was particularly interesting because when the mandible was stabilized by the bite block, the surrounding musculature was visibly more relaxed, perhaps contributing to the output of better vocal quality.

Articulation and Prosody

As we conversed with each boy, faulty production of a few phonemes seemed to account for the majority of his articulation errors. To determine the degree to which

Table 3. Summary of non-speech motor evaluation, supplemented with motoric developmental history.

Child	Oral-Facial Evaluation	Hand Praxis Evaluation	Gross & Fine Motor History	Handedness
Boy #1. 8:2 yrs	Strengths: -No overt weakness -Able to execute isolated movements Weaknesses: -some problems with sequential volitional movements -Left to right tracking confusion	Strengths: -Able to execute single movements Weaknesses: -Motorically inaccurate movements -Sequencing difficulties -Lots of motor overflow	-Delayed motoric development -Cannot yet ride a bike or catch a ball -Fine motor deficits very evident. Poor handwriting ability	-Right
Boy #2. 9:7 yrs	Strengths: -No overt weakness -Able to execute isolated movements Weaknesses: -Groping movements of articulators -Left to right tracking confusion	Strengths: -Normal execution of sequence of hand movements Weaknesses: None noted	-Slow motoric development -Described as clumsy by parent -Tactually defensive -Poor handwriting ability	-Right, with tendency to ambidextrousness
Boy #3. 8:9 yrs	Strengths: -Able to execute isolated movements Weaknesses: -Transitional groping and hesitancy of movement when changing from one movement to another -Drooling quite evident	Strengths: -With effort was able to execute movements Weaknesses: -Great many additional hand movements -Hesitations during transition from one movement to another	-Delayed motoric development. -Right side body weakness -Low muscle tone -Poor handwriting ability	-Left, with tendency to ambidextrousness

Child	Norms (Timed in Sec)	Phoneme Repetitions	Production Without Bite Block	Phoneme Production With Bite Block
Boy #1. 8:2 yrs	4.2 4.4 4.8 6.2 7.2 8.3	pù tù kù pù tù tù kù pù tù kù	6.0. inappropriate loudness levels 6.5 mandibular bouncing 6.5 mandibular bouncing 15.0 articulatory groping & sequencing problems N/S not scored 18.0 training required to achieve appropriate sequencing with controlled rate of production	11.0 low vocal intensity 13.0 motorically tentative 8.0 production rate steadier 20.0 production rate steadier N/S not scored 28.0 imprecise production requiring many breaths
Boy #2. 9:7 yrs	4.0 4.1 4.8 5.9 5.0 7.7	pù tù kù pù tù tù kù pù tù kù	4.0 irregular production 4.1 mandibular bounding 4.8 mandibular bouncing with increased production rate 5.9 5.0 5.5 motoric discoordination on transitions between articulatory movements	6.0 required 3 breaths 5.0 required 2 breaths 4.8 7.5 7.0 10.5 lots of sequencing errors and oral groping of articulators
Boy #3. 8:9 yrs	4.2 4.4 4.8 6.2 7.2 8.3	pù tù kù pù tù tù kù pù tù kù Phoneme	6.0 pitch and rate variation 5.0 mandible clenched 5.0 8.0 sequencing confusion 7.5 irregular rate and loudness levels 12.0 irregular rate and incoordination on articulatory transitions from phoneme to phoneme	6.0 decreased loudness levels 5.0 6.0 7.0 production rate better than previously seen 7.0 8.5 loudness, pitch, and rate improved with bite block; still some evidence of motoric groping

Table 4. Diadochokinetic rate procedures for three school-age boys with motor speech disorders. Included are Fletcher (1978) norms (rate of phoneme repetitions in seconds x age) and clinical observations of motor movements during task.

phonological errors occurred in single words, a standardized articulation test was used to assess articulatory performance. Performance load factors, such as increasing the length of utterance have been shown to negatively affect the articulatory performance of children with motor speech disorders. In 1981, Ludwig and Crary determined that phrase repetition elicited significantly more articulation errors than single word repetition in a group of eight children with developmental motor speech disorders. Sixty phrases that systematically present all English phonemes (Crary, 1993) were used to provide performance load factors during articulatory production. Test results revealed that the "s" phoneme was consistently in error in the speech production of all three boys. However, for the most part, inconsistent phonemic production was limited to a small number of speech sounds. A summary of articulatory errors is listed in Table 5 (page 12) which has been designed to display select communication test scores, including articulation, as an overview of the boys' communicative abilities.

The melodic intonation of language was noticeably different in these school-age boys with developmental motor speech disabilities. The parameters of loudness, pitch, and pausing were often inappropriate during conversational speech. Although these factors are easily identifiable, they are not easily quantified without expensive equipment. Regrettably, most clinicians do not have access to such equipment. Following guidelines put forth by Hargrove and McGarr (1994) to measure such prosodic variables, we applied a three-point rating scale to evaluate each prosodic parameter. We relied on our clinical judgment to make these determinations and included a descriptive analysis with each rating. Greater variations in loudness and pitch were noted when the speaking situation became stressful. Evaluation of diadochokinetic syllable rate elicited such behavior. As the requirements for rapidly producing a sequence of syllables increased, loudness and pitch levels changed markedly in all three boys.

Conversational Competency

Described by their parents as marginally competent conversationalists, poorly developed conversational skills contributed to frequent communication breakdown. As adult speakers we abide by rules that regulate conversation (Grice, 1975). These guidelines direct us toward the basic premise of communication which is "cooperative effort and a common purpose during exchange of information" (p. 45). In unspoken agreement, speakers and listeners agree to make their contribution to the conversation as informative as possible (but not too informative), truthful, void of ambiguity and obscurity of expression, as well as orderly and brief. Three conversational skills become very important during the elementary school years. First, if children need additional help from their teacher in comprehending a set of instructions, they must ask for clarification. When a request for clarification is appropriately issued, it will usually elicit the principle of "cooperative effort" and additional attention will be forthcoming. Second, acquiring the speaker role is a conversational skill that becomes important when children contribute to classroom discussions. Pausing regulates turntaking during conversation, thereby allow-

ing the role of speaker to move to the listener without interruption. For this to occur, a listener must anticipate when the speaker is going to cease speaking for purposes of inhalation. Then, at this moment the listener may assume the role of speaker by beginning to speak. Third, providing a referent or "old information" (Clark & Clark, 1977) in each utterance to orient the listener to the topic of conversation is extremely important. Lack of attention to this skill creates ambiguous conversational events where the listener is forced to interrupt the speaker in order to get oriented to the topic. This interaction, specifically, leads to frequent communication breakdown.

Despite the dearth of normative data documenting the development of these conversational skills, we evaluated them in two ways. Parents were asked if they considered their child to be skilled in: (1) gaining the speaker role without frequent interruptions, (2) establishing a referent for each utterance, and (3) asking for clarification by paraphrasing or other method in a manner that encourages a positive response. Parental reports were supplemented with clinical observations. We simply noted whether breaches in these communication skills occurred. Overall, the boys were all rated as lacking in conversational competency for these particular skills. They tended to frequently interrupt their parents. Furthermore, it was obvious that they were unaware of their responsibility in creating a communication breakdown when they failed to provide a topic reference. When this occurred, not one boy attempted to self-correct unless he was prompted to do so. Parents reported that their son rarely asked for clarification of an instruction, nor could they remember a time when he had attempted to paraphrase what was said to him. Parents classified their sons' ability to ask for assistance in an appropriate manner as an emerging skill, not yet fully mastered. Identification of these specific communication deficits seemed to clarify many of the parents' questions about "how and why" the communication style of their sons differed from that of peers.

Language Skills

Syntax and semantics were assessed. Test results (see Table 5) clearly showed receptive and expressive semantic development to be a language strength for all three boys. Receptive and expressive syntax skills were also found to be age-appropriate (see Table 5). Interestingly, even though these boys occasionally omitted morphemes and functors during spontaneous speech, their understanding of the rules of grammar was age-appropriate. Inadequate rule development may, therefore, be ruled out as an explanation for the occurrences of these ungrammatical forms.

Reading

For these three boys, reading competency was described by parents and/or by school report to be one or more years behind the level of classmates. Word recognition and comprehension (Spache, 1981) and phonological awareness (Lindamood Auditory Conceptualization Test, 1979) were aspects of reading performance screened. Word Recognition (Spache, 1981) was selected because children identify single words either by sight and/or by phonic decoding. Each boy recognized many of the vocabulary words at the first grade reading level (see Table 5) but were unable to demonstrate sufficient competency to be classified as a second grade reader. Each boy made attempts to phonically decode some of the vocabulary items. These attempts at decoding were often unsuccessful, however. Deficits in sound-symbol relationship, sound analysis, and sound blending were common to all of the boys. The deficits became even more apparent when the Lindamood Auditory Conceptualization Test (LAC) was given. The LAC evaluates phonological awareness in sequences of phonemes that are not true words. In this test, when the task required analysis of one phoneme in a sequence of three or four phonemes, evidence of frustration soon became obvious. Every boy achieved a higher score on the comprehension passages (Spache, 1981) than on the word recognition subtest. They appeared able to understand the printed word, even though they were unable to easily decode it.

Table 5. Select communication test results for three school-age boys with motor speech disorders.

Child	Phoneme Production Phonemic Errors	Semantics: Vocabulary Standard Score Mean = 100 (sd = +/15)	Syntax: Morphemes Standardized Subtest Score Mean = 10 (sd = +/-3)	Morpheme Deletions During Conversational Sample	Reading Diagnostic Reading Scales Spache (1981)
Boy #1. 8:2 yrs	r, j, dz, l, th frontal lisp	ROWPVT SS = 123 EOWPVT-R SS = 130	CELF-R subtests Sentence Structure..10 Word Structure.....7	Moderately Severe	Word Recognition 1.4 grade level Comprehension good
Boy #2. 9:7 yrs	s, r frontal lisp	ROWPVT SS = 114 EOWPVT-R SS = 108	CELF-R subtests Sentence Structure.. 8 Word Structure.....10	Mild	Word Recognition 1.8 grade level Comprehension good
Boy #3. 8:2 yrs	s, z, l sh, th lateral lisp	ROWPVT SS = 96 EOWPVT-R SS = 122	Not tested Conversational speech patterns did not suggest overall ungrammatical sentence patterns	Mild	Word Recognition 1.8 grade level Comprehension good

This is not surprising, in light of the fact that they have well-developed semantic and syntactic levels of language development.

Clinical Implications of These Communication Deficits

It is important for speech-language pathologists to be aware that developmental motor speech disorders continue beyond the preschool years. Deficits in articulation, motor speech production, and prosodic features were still somewhat problematic for these school-age boys even though the actual number of articulation errors was small. Concomitant weakness in fine and gross motor development appeared to disrupt academic skills. Penmanship was one example. Fine motor impairment retarded the ability to write, slowed the rate at which school assignments were completed, and resulted in a poor appearance of school assignments. As we prioritized communication deficits from most to least influential in the child's life, the inability to read was judged by parents as the deficit of most significance. Dysfunction in conversational competency was rated as second in importance to these boys' overall ability to communicate.

Creativity and clinician ingenuity are never in more demand than when working with this age group of communicatively disordered children. After several years of traditional speech therapy, each boy stated that he was tired of therapy. Ways need to be found to address these persisting communication disorders in a manner that is acceptable to the child. For example, situations or events, where articulatory preciseness is highly valued could replace some, or all, routine articulation drill activities. Drama or diction class was suggested as an environment that would elicit correct articulatory performance, if a child were interested in participating in the activity. Rap music, with socially appropriate words, might be another avenue for eliciting clearly enunciated speech. Both activities would serve the long term goal of accurate speech production without engaging traditional drill-type activities.

The use of a computer should increase the speed, accuracy, and appearance of school assignments that have been disrupted by poor fine motor coordination. Although highly theoretical, a sight word approach, paired with a phonics instructional approach for reading might promote faster word recognition. Colheart (1980) suggests that a phonics approach to reading directly inputs to the phonological analyzer—where linguistic stimuli and motor planning are thought to be very interwoven in the brain—before the semantic analyzer is activated. However, visual input required for sight word reading (i.e., word recognition), directly accesses the semantic analyzer and actually bypasses the phonological analyzer. Accessing well-developed semantic lexicons of these boys during sight word recognition may bridge dysfunction created by articulatory motor performance, thereby promoting more rapid word recognition growth. While such a route to reading achievement may be circuitous, nevertheless, for children with developmental motor speech disorders, pairing sight word recognition with phonic methods may be the "leg up" that these children need to facilitate good reading skills.

In summary, these three elementary school-age boys with motor speech disorders were largely intelligible, but their expressive output was noticeably different from that of other boys their age. Even though only a few phonemes were misarticulated and minor errors of grammar occurred, they were considered to be marginally competent communicators by their parents. Deficiencies in select conversational sills contributed significantly to this parental evaluation. Communication deficits in academic performance were also prominent. Reading and writing skills were evaluated as below grade level. Based on the communication performance of these three boys, dysfunction in all linguistically-based skills were shown to be present. This leads us to conclude that motor programming problems have the potential for disrupting the full range of emerging communication skills.

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Spanish Phonology: A Review of the Literature

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Enrollment of culturally and linguistically diverse students, particularly Spanish speaking students, has significantly increased in schools throughout the United States. Speech-language pathologists are in need of information about Spanish phonology in order to evaluate and treat their culturally and linguistically diverse clientele. The purpose of this paper is to provide information about normal and disordered phonological skills in Spanish speaking children. Eight studies are reviewed with Mexican, Puerto Rican and Cuban speakers of Spanish. Developmental, dialectal, and phonological process errors are noted. In summary, there is little data concerning normal and disordered Spanish phonology, especially that of Caribbean Spanish (Puerto Rican or Cuban) speakers. This paper has attempted to shed some information on this.

Enrollment of culturally and linguistically diverse students, particularly Spanish speaking students, has significantly increased in the educational system in the United States. Speech-language pathologists (SLPs) are in need of current information about Spanish phonology in order to conduct appropriate assessments and provide effective therapeutic intervention (Brice & de la Paz, 1994; Goldstein, 1995). Goldstein has stated that,

> Due to a lack of information on phonological acquisition in the Latino population in general and across the various Spanish dialects in particular, speech-language pathologists face a difficult task in providing appropriate diagnostic and intervention services to Spanish speaking children (p. 18).

Clearly, knowledge of normal and disordered Spanish phonological processes is necessary for today's SLP. Unfortunately a paucity of studies dealing with normal and disordered Spanish phonology exists.

Normal Spanish Phonology

Few studies have examined normal Spanish phonological development. In a review of the literature, only four studies on normal Spanish phonology were found (Diamond, 1982; Martinez, 1986; Rivera-Umpiere, 1988; Paulson, 1989)[1]. Three of these four studies used Mexican Spanish speakers for their sample (Diamond, 1982; Martinez, 1986; Paulson, 1989), and one (Rivera-Umpiere, 1988), used Puerto Rican Spanish speakers. Each study is described briefly.

Diamond (1982) studied normally developing four year old bilingual Mexican American children in San Diego, California. She used the Assessment of Phonological Processes-Spanish (APP-S) developed by Hodson (1986). Diamond found that consonant sequence reduction was the most prevalent omission process with tap/trill /r, r/ deviation the most frequent omission process. She concluded that the phonological performance of the bilingual children "appeared to approximate closely the speech of adult models in their community" (p. 93).

Martinez (1986) also studied normal Mexican American Spanish phonological development in San Diego, California. Her study employed younger, three year old, children. Ten children ranging from 3:6 to 3:11 served as subjects. She also used the APP-S for data collection. Percentage-of-occurrence scores were as follows: (1) tap/trill /r, r/, 37%; (2) consonant sequence reduction, 16%; (3) post-vocalic singletons, 8%; (4) lateral (l) and stridents, 7%; and (5) syllable reduction, 6%. Velars, glides, nasals and prevocalic singletons were all at or below 4%. The high percentage-of-occurrences errors for the tap/trill /r, r/ and postvocalic singletons appeared to be characteristic of the Mexican Spanish dialect. Canfield (1981) has noted that vowel reduction in unstressed syllables in highland Mexico, and hence most of Mexico, occurs quite frequently in Mexican Spanish. The fact that the tap/trill /r, r/ had high percentage-of-occurrence scores indicated that it, too, is likely characteristic of Mexican Spanish.

Rivera-Umpiere (1988) studied 10 three year old and 10 four year old Puerto Rican Spanish speaking children. She also utilized the APP-S protocol. The results from her study indicated that substitutions of /l/ for /r/, and substitutions of posterior fricatives for the Puerto Rican /r/ occurred. According to Canfield (1981), these are characteristic of Puerto Rican Spanish. Stridency deletion of word final /s/ also affected phonological process scores. Canfield states that, "/s/ syllable final tends to be aspirated or dropped entirely" (p. 79).

Paulson (1991) studied three groups of Mexican Spanish speaking children (n = 30) in Dallas-Ft. Worth, Texas. The group ages were 2:4 to 2:8, 3:1 to 3:5, and 3:10 to 4:2. She administered the APP-S. Her immediate findings were that the phonological processes most affected were consonant sequence reduction, tap/trill /r, r/ sounds, and strident sounds. As noted above, processes with the tap/trill /r, r/ and stridents are highly affected by the Mexican Spanish dialect and are not necessarily disordered phonological processes. In sum, several phonological processes are influenced by Mexican and Puerto Rican dialects of Spanish. These include: tap/trill sounds, postvocalic singleton omissions, particularly /s/ finals, and strident omissions. The phonological process of consonant sequence reduction appears to be a phonological deficiency that is common to both the Mexican and Puerto Rican Spanish dialects. These features are summarized in Table 1.

Disordered Spanish Phonology

From a review of the literature it appears that only four studies have addressed the issue of disordered Spanish phonology

Table 1. Summary Features of Normal Spanish Phonology

Author, Features		Dialectal Influence
Diamond (1983)		
1.	Consonant sequence reduction	No
2.	Tap/trill /r, ɾ/	Yes
Martinez (1986)		
1.	Tap/trill /r, ɾ/	Yes
2.	Consonant sequence reduction	No
3.	Postvocalic singleton	Yes
4.	Lateral /l/, stridents	Yes
5.	Syllable reduction	No
Rivera-Umpiere (1988)		
1.	/l/ for /r/ substitutions	Yes
2.	Stridency deletion	Yes
Paulson (1991)		
1.	Consonant sequence reduction	No
2.	Tap/trill /r, ɾ/	Yes
3.	Strident sounds	Yes

(Brice & de la Paz, 1994; Goldstein, 1995; Meza, 1983; Villanueva, 1990). A brief review of those studies will be presented.

Meza (1983) studied 20 Spanish speaking children from southern and Baja California. She examined four phonological categories using the APP-S: (1) segment omissions, (2) class deficiencies, (3) substitution processes, and (4) miscellaneous error patterns. The results were analyzed according to percentage-of-occurrence errors for segment omissions and class deficiencies. Frequency of occurrence data was reported for the other two categories (i.e., substitution processes and miscellaneous error patterns). Her findings indicated that liquid-tap /r/ and the Spanish trill /r/ deviation was the most frequent error process, while consonant sequence reduction was the second most prevalent error process. Class deficiency processes with strident phonemes, /l/ liquids, and postvocalic singleton omissions followed in order of prevalence. Assimilation was the most prevalent substitution process. Meza found that the means for the above mentioned phonological processes were above 50%. Thus, these phonological errors contributed highly to unintelligible speech.

Goldstein (1995) examined the disordered phonological speech of Puerto Rican Spanish speaking children in Philadelphia, Pennsylvania using the Assessment of Phonological Disabilities (Iglesias, 1978). Goldstein found that the following error processes occurred with the highest percentage: (1) liquid simplification, 94%, (2) stopping, 93%, (3) assimilation, 87%, (4) cluster reduction, 83%, (5) unstressed syllable deletion, 81%, and (6) palatal fronting, 20%. The studies by Meza (1983) and Goldstein differed with respect to cluster reduction and unstressed syllable deletion. Goldstein mentioned that the difference of cluster reduction could be attributed to a difference in the process definition. Meza defined it as contiguous segments in abutting consonants and word-initial clusters. Goldstein only considered word-initial consonant pairs. The difference of unstressed syllable deletions seemed to count as an error of Mexican Spanish, however not for the Puerto Rican Spanish dialect.

Villaneuva (1990) investigated a limited sample of five Puerto Rican Spanish speakers. The three and four year old students were identified as having disordered Spanish with the Assessment of Phonological Processes-Spanish (APP-S). Her results indicated that the percentage-of-occurrence means for the ten basic processes were as follows: (1) postvocalic singleton omission, 72%; (2) strident deficiency, 62%, (3) tap/trill /r, ɾ/ sounds, 61%; (4) consonant sequence reduction, 56%; (5) lateral /l/, 35%; (6) glides, 31%; (7) syllable reduction, 20%; (8) velars, 19%; (9) nasals, 18%, and (10) prevocalic singleton omission, 9%. Retention of postvocalic singletons may not be as great a factor in maintaining intelligibility in Spanish (Brice & de la Paz, 1994); therefore, the highest percentage-of-occurrence errors in the Villaneuva study may be dialectally influenced, particularly for Caribbean Puerto Rican Spanish speakers. Stridency tends to be a dialectal feature, particularly a Caribbean Spanish Dialect. The Puerto Rican tap/trill /r, ɾ/ can also be affected due to dialect. Canfield (1981) stated that "in western Puerto Rico, there is a strong tendency toward acoustic equivalence of /l/ and /r/ syllable final..." (p. 76) sound. Thus, a high percentage of the above errors are influenced by dialect and may not be considered disordered.

Brice & de la Paz (1994) studied 21 children in a clinical study in Miami, Florida. The data were gathered in a clinical setting over a period of six years. The children were grouped according to Spanish versus English phonology test results. Children were tested using one of two versions of the Assessment of Phonological Processes (APP), that is the Revised and the Spanish versions. The children ranged in age from 2:10 to 6:3 (n = 21). None of the children had been previously enrolled for phonology or articulation therapy and none evidenced hearing problems.

Results from this study indicated that the severity level of subjects ranged from mild/moderate to severe/profound with approximately half being divided into each severity grouping. The results of the Brice & de la Paz (1994) study indicated significant differences among Spanish versus English group means on the processes of postvocalic singleton omission, stridency deficiencies, nasal deficiencies, and glide deficiencies.

Postvocalic singleton omission was found to be higher with the Spanish sample. Spanish syllable structure does not emphasize final consonants. Therefore, retention of postvocalic singletons may not be as great a factor in maintaining intelligibility in Spanish. Stridency deficiencies were also found to be higher with the Spanish sample. Stridency tends to be a feature affected by dialect due to position, particularly a Caribbean Spanish (predominantly Cuban Spanish) dialect as evidenced by the Spanish speakers in this study. Nasal deficiencies were found to be higher with the Spanish sample. A word final assimilation shift may be affecting this result due to a dialectal influence. Glide deficiencies were also found to be higher with the Spanish sample. This feature is also affected by dialect. Phonological interference across Spanish and English may be occurring with many processes. Thus, some group differences found in this study may be attributed to variations in dialect or interference issues. A summary of these features is in Table 2.

Table 2. Summary Features of Disordered Spanish Phonology

Author, Features		Dialectal Influence
Meza (1983)		
1.	Tap/trill /ɾ, r/	Yes
2.	Consonant sequence reduction	No
3.	Class deficiencies	
	Stridents	Yes
	/l/ Liquids	Yes
	Postvocalic singletons	Yes
4.	Assimilation	No
Goldstein (1995)		
1.	Liquid simplification	Yes
2.	Stopping	No
3.	Assimilation	No
4.	Cluster reduction	No
5.	Unstressed syllable reduction	Yes
6.	Palatal fronting	No
Villaneuva (1990)		
1.	Postvocalic singleton omission	Yes
2.	Stridents	Yes
3.	Tap/trill /ɾ, r/	Yes
4.	Consonant sequence reduction	No
5.	Lateral /l/	Yes
6.	Glides	Yes
7.	Syllable reduction	No
8.	Velars	No
9.	Nasals	Yes
10.	Prevocalic singleton omission	No
Brice & de la Paz (1994)		
1.	Postvocalic singleton omission	Yes
2.	Stridents	Yes
3.	Nasal deficiencies	Yes
4.	Glide deficiencies	Yes

Discussion

To date normal (Diamond, 1982; Martinez, 1986; Rivera-Umpiere, 1988; Paulson, 1989) and disordered phonological processes (Brice & de la Paz, 1994; Goldstein, 1995; Meza, 1983, Villaneuva, 1990) in bilingual Spanish speaking children have not been extensively examined. It has been known that different languages present similar phonological processes; however, the extent of error process-of-occurrence has not been studied in detail. The purpose of this paper was to examine normal and disordered phonological processes of Spanish speaking children.

It appears from the normal phonological studies that certain phonological processes may be affected due to the speaker's dialect of Spanish. The dialectal feature may inflate a phonological process-of-occurrence score and thus make the child look disordered when, in fact, she/he may not be. The features most affected by dialect appear to be those that involve tap/trill sounds, postvocalic singleton omissions, particularly /s/ finals, and strident omissions.

It appears from the disordered studies that phonological process errors are more prevalent in the first language. When children acquire a second phonological system, i.e. English, then the error patterns seem largely affected in the primary language (Hodson, personal communication, November 17, 1994).

It is known that Spanish syllable structure does not emphasize final consonants (Canfield, 1981). It also appears that retention of vocalic singletons is also prone to deletion. Stridency deficiencies were also found to be higher with the Spanish sample. Stridency tends to be a feature affected by dialect due to position, particularly a Caribbean Spanish dialect, as evidenced by the Spanish speakers in this study (Goldstein, personal communication, December 9, 1995). Phonological interference across Spanish and English may be occurring with many processes (Hodson, personal communication, November 17, 1994). Thus, group differences in some of the studies may be attributed to variations in dialect or interference issues.

In summary, there is a paucity concerning normal and disordered Spanish phonology, especially that of Caribbean Spanish (Puerto Rican or Cuban) speakers. This paper has attempted to shed some information on this. Treatment efficacy continues to be an issue that needs to be addressed. It is hoped that speech-language pathologists will examine this issue vigorously.

Footnote

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Application of Various Production and Reception Measures to a Fluency Evaluation: A Case Report

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A diagnostic evaluation was administered to ST, a young adult male with a reported fluency disorder. This evaluation consisted of standard fluency assessment tasks. In addition, respiratory, laryngeal, supralaryngeal, and auditory processing measures were obtained in order to assess their clinical utility. Results indicated a diagnosis of stuttering as well as an auditory processing deficit. Stuttering treatment was recommended. Also recommended was that consideration be given to restructuring the clinical environment to allow the client to process information more easily. Overall, this evaluation offers support for the use of additional diagnostic procedures with clients who stutter.

In comparative studies of those who stutter and those who do not, broad characterizations have been made with respect to production and reception. That is, group differences have been found for individual respiratory (Hutchinson & Navarre, 1977; Murdoch, Killin & McCaul, 1989), laryngeal (Bakker & Brutten, 1989; Dembowski & Watson, 1991), supralaryngeal (Hulstijn, Van Lieshout & Peters, 1991; Perkins, Bell, Johnson & Stocks, 1979), and auditory processing measures (Dietrich, Barry & Parker, 1995; Moore, 1986; Zimmerman & Knott, 1974). Because of this, some researchers (e.g., Bakker & Brutten, 1990; Williams & Brutten, 1994) have suggested that these types of measures be used clinically. One potential use is differential diagnosis. When employed with routine assessment tasks, more data become available to the diagnostician and he/she can better match the client's performance to general profiles consistent with various fluency disorders. In addition to diagnostic application, the aforementioned measures might be utilized therapeutically. For example, a stuttering client presenting difficulties in one or more of these areas might require more of different treatment goals and/or different presentation of fluency goals than a client who only stutters.

However, clinical use of additional production and processing measures is contraindicated by two points. First, there are investigations in which group differences were not found (Bakker & Brutten, 1987; Cross & Olson, 1987; McFarlane & Shipley, 1981; Pinsky & McAdam, 1980). Secondly, it must be stressed that, when differences were found, they were between groups. As such, the findings do not necessarily hold true for all individuals who stutter. It is unclear, then, if such measures can be of clinical value. That is, by collecting additional data, does the clinician benefit or, conversely, use valuable time preparing and administering tasks that will be of limited diagnostic assistance? The purpose of the following case report was to assess the clinical utility of measures of various components of the speech, language, and processing systems. Specifically investigated with an individual client were whether these measures assisted clinically with (1) differential diagnosis and (2) therapy recommendations.

Evaluation Report

In order to investigate the utility of additional diagnostic measures, an extensive evaluation was administered at the Florida Atlantic University Communication Disorders Center (FAU-CDC) to ST, an adult male professional in his early thirties. ST was a self-referral whose only reported communication disorder was a stutter. The evaluation included tasks routinely administered for fluency evaluations at the FAU-CDC, including case history interview, speech sample, audience effect, attitude scales, expectancy, consistency, adaptation, fluency enhancement, and assessment of oral-motor skills, language, and hearing. In addition to these tasks, respiration, phonation, changes in supralaryngeal configurations, and different levels of auditory processing were investigated. Evaluation tasks were administered by a graduate student in the Department of Communication Disorders and two clinical supervisors.

During the case history interview, ST stated that he had previously received therapy for stuttering during grade school and also while he was a graduate student. Each time, little progress was made. No other therapy was received, as ST reportedly did not present any other deficits of speech, language, hearing, or learning. ST's speech during the interview and subsequent language sample were characterized by sound and syllable repetitions, prolongations, and interjections. In all instances, the part-word repetitions and prolongations occurred in the initial word position. Associated movements of the face and head accompanied these disfluencies. The interjections appeared to be used to avoid stuttering. Word substitutions were also clearly used for this purpose. Fluency improved as ST spent more time with the student examiner. When audience size increased from one to two listeners, fluency decreased to the previous level and again improved with time.

In addition to a speech sample, fluency assessment data were obtained. ST scored 60 on the Fear Survey Schedule (Brutten, 1973), indicating fears unrelated to speech that were not extreme. On Andrews and Cutler's (1974) version of Erickson's (1969) S-scale, 11 of the 24 answers were indicative of speech-related concerns, again well within normal limits. Both parts of the Speech Situation Checklist (Brutten, 1973) were also administered. The client's score of 95 on the Emotional Response portion of this checklist denoted negative emotion associated with speech across various situa-

tions that are typical for an adult. He scored 84 on the Speech Disruption portion, indicating that his speech is not excessively disrupted across different speaking situations. When completing the Behavior Checklist (Brutten, 1973), ST noted 12 behaviors used to aid his speech. These included a variety of facial movements, head jerks, interjections, and word substitutions. He demonstrated limited expectancy when tested with the Rainbow Passage (Shipley & McAfee, 1992). On the 12 words on which he would likely stutter, only one was actually stuttered when the passage was read aloud. On five successive readings of the Grandfather Passage (Shipley & McAfee, 1992), little consistency was noted. Of 19 disfluencies over the five readings, two occurred on words disfluent in a previous reading. During this task, changes in pitch, loudness, and prosody were noted on readings two through five. These appeared to be used to avoid disfluencies. Perhaps because of these avoidance behaviors, adaptation was present most strikingly between readings one and two. The number of disfluencies on the consecutive readings was 10, 1, 2, 4, and 2. Avoidance behaviors were not evident when ST read The Spider's Home (Shipley & McAfee, 1992) in unison with the student clinician. Two disfluencies were noted during this task.

Informal assessment of articulation indicated performance that was within normal limits. Examination of the oral-motor mechanism revealed structure and function that were adequate for the production of speech. Likewise, language was normal, based on formal testing. On The Reporter's Test (DeRenzi & Ferrari, 1978), ST scored 224, about one standard deviation above the mean for normal adults (Wener, 1983). ST made two errors on Part V of The Token Test (DeRenzi & Vignolo, 1962), again about average for a normal adult (Wener, 1983). During this task, however, noticeable pauses were observed prior to answering more complex test items. Finally, peripheral auditory test results revealed hearing sensitivity to be well within normal limits. Pure tone averages were 15 dB HL bilaterally. Speech discrimination ability, using W-22 word lists, was excellent as reflected by scores of 95% bilaterally. Immittance measures showed normal middle ear function.

In addition to the standard evaluation measures already noted, assessment data were obtained from tasks not routinely done during fluency evaluations at the FAU-CDC. Using a spirometer (Phipps & Bird, Model No. 7087-100), ST's tidal volume, averaged over three cycles, was 700 ml. His vital capacity, averaged over three attempts, was 4860 ml. These respiratory measures are within normal limits for adult males (Palmer, 1993).

Measures of phonatory function were obtained with the Multi-Dimensional Voice Program (Kay Elemetrics, Model No. 4305) of the Computerized Speech Laboratory (Kay Elemetrics, Model No. 4305). ST produced three fluent trials for each of the vowels /a, i/ and the low back vowel "au." Specific measures taken from the prolonged vowels were jitter and shimmer, as these reflect variability of vocal fold movement (Colton & Casper, 1990). ST's average jitter was 73.44, 41.85, and 50.85 usec for the respective vowels. Shimmer means were 0.34, 0.15, and 0.35 dB. Ranges were 21.49 - 123.44 usec for jitter and 0.13 - 0.49 dB for shimmer. All means, as well as all individual measures, were within normal limits for adult males, based on available norms (Baken, 1987; Deliyski, 1995). This is not only evidence for normal phonatory function[1], but also indicates that such normality did not vary across different vowels. Stated differently, changes in supralaryngeal configurations did not impact phonatory performance.

Also administered were a selection of behavioral and physiological tasks used to assess auditory processing. Test procedures included the administration of speech discrimination for words out of context in a background of cafeteria noise (+10 dB HL signal to noise ratio), the Staggered Spondaic Word Test (Katz, 1987), a carefully controlled version of a dichotic digit test (Saul, 1982), and the Duration Pattern Sequence Test (Musiek, Baran & Pinheiro, 1990). In addition, electrophysiological measures were obtained, including the auditory brainstem response and the P300 late cognitive evoked potential. The tasks, both behavioral as well as physiological, were selected in order to stress ascending areas of the central auditory nervous system. Speech discrimination in noise and the auditory brainstem response primarily assess peripheral and low brainstem integrity whereas dichotic procedures, Duration Pattern Sequence Test, and the P300 late cognitive evoked potential are primarily sensitive to cerebral level processing.

Speech discrimination ability in noise was excellent as reflected by scores of 92% bilaterally. The Auditory Brainstem Responses obtained showed clear and repeatable wave morphology with normal wave latencies (wave V absolute latency = 5.12 ms). Results of the Staggered Spondaic Word Test were within the normal range when compared with normative data (Katz, 1987). This is a dichotic listening procedure in which words are presented, one to each ear, partially overlapping in time. Results can be viewed as an appraisal of the individual's ability to process complex auditory information. Although results were quantitatively normal, ST's response latencies were lengthened and the subject reported that the task was difficult, requiring a great deal of concentration. Results of the dichotic digit test were within normal limits for the left ear (94%) and outside the normal range (83%) for the right ear (Saul, 1982). For this procedure, the stimuli were edited for equal duration and were presented in a two pair per trial sequence. Additionally, the Duration Pattern Sequence test was administered. With this task, tones of different durations were presented three at a time. The subject was required to indicate the pattern of the durations (e.g. long, short, short). The subject achieved scores of 64% and 84% for the right and left ears respectively. The former score is below acceptable limits for the right ear (Musiek, Baran & Pinheiro, 1990). Finally, the P300 Cortical Evoked Potential showed the expected wave morphologies and latencies.

Based upon all of the test results, ST was diagnosed with stuttering and processing deficits. Direct therapy was recommended for stuttering. However, additional recommendations were also made. The purpose for these was to keep processing deficits from possibly hindering therapeutic progress. Specifically, it was recommended that, in demanding listening situations, the clinical setting be kept quiet and that instructions be given in short, meaningful steps that can be reviewed periodically.

Discussion

The subject, ST, exhibited disordered fluency. When other aspects of communication were assessed, he presented normal articulation, language, respiration, phonation, hearing acuity, and speech discrimination ability under ideal listening conditions as well as in a background of competing

noise. In addition, normal responses were obtained on the Staggered Spondaic Word Test and physiological brainstem and cerebral level tasks, specifically the Auditory Brainstem Response and the P300 Cognitive Evoked Potential. However, ST showed some difficulty on tasks which placed stress on higher levels of auditory processing[2]. He exhibited difficulty in processing competing auditory input arriving at both ears simultaneously (dichotic digits), and in sequencing various tone durations (Duration Pattern Sequence Test).

These evaluation results only partially support the diagnostic usefulness of additional production and processing measures. Use of such measures to help with differential diagnosis of disordered fluency was, in this case, helpful but not essential. While the auditory processing results support some group data on people who stutter, results of the attitude scales and overt speech production tasks were sufficient to characterize ST's speech deficit as stuttering, as opposed to another disorder of fluency. That is, a suitable number of results consistent with a diagnosis of stuttering was obtained from routine fluency diagnostic measures. For example, ST presented prolongations and repetitions during speaking tasks, associated avoidance and escape behaviors, similar scores on the two sections of the Speech Situation Checklist, and improved fluency when reading in unison.

With respect to therapy recommendations, it can be argued that additional measures were useful. ST presented auditory processing difficulty under more stressing conditions, which could interfere with more involved therapy paradigms. It was recommended that, during therapy involving high processing loads, the listening environment be structured to afford ST every opportunity to decode auditory information presented to him. During these times, the environment should be as quiet as possible and verbal instructions should be kept in relatively short and meaningful steps. ST might also be helped by allowing him to verify that he understands task instructions. This can be very important with stuttering therapy in which each new procedure is performed along with all other procedures (e.g. regulated breathing, easy initiation of speech, continuous voicing, soft articulatory contacts, etc.), and may thus require the processing of relatively large amounts of information.

It should be noted that for the auditory processing tasks utilized in this evaluation, stimuli were presented that were out of context and required immediate recall. This was done to place stress on the individual's auditory/phonetic processing systems. As such, the tasks represent abnormal stress on ascending central auditory nervous system function and not necessarily everyday processing situations. It is possible that ST's processing difficulty would not hinder treatment to a great extent. Rather, it may be a matter for the clinician to monitor during intervention.

Despite the difficulties in incorporating the additional task results into the clinical recommendations, there is some evidence for the usefulness of additional diagnostic measures. It is also evident that such measures are not possible in all clinical settings. Still, it is often possible to evaluate more than is routinely done. Clinicians need to devise a number of tasks that can be efficiently used in their settings and that effectively acquire information about various levels of production and reception. It is possible that, in some cases, additional deficits may not be found. But as yet there is no way to determine when this is likely to occur. In the present report, an additional deficit was found unexpectedly. It is likely that other clients will also present deficiencies that, while not overt, can nevertheless impact therapy. To the extent that clinicians are failing to uncover these deficits, treatment may be less extensive and successful than it could be.

Footnote

[1]The authors realize that jitter and shimmer can be imprecise with few samples (Kent & Read, 1992). For this reason, three samples of each vowel were obtained and averaged. While variability was present, as reflected by the ranges, the means do show evidence of normal jitter and shimmer, based on comparisons to established norms.

[2]Because two of the three behavioral tasks were problematic, the diagnosis of processing involvement was warranted. The other two auditory processing tasks were physiological and administered to assist with differential diagnosis. That is, these two tasks have differentiated groups of stuttering individuals from controls and, therefore, can be useful in constructing a general profile consistent with a diagnosis of stuttering. However, it is the auditory behavior of the subject that is most informative with respect to uncovering an actual processing deficit.

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The Transparency of Amer-Ind Code

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Three types of Amer-Ind gestures were investigated: bilateral, unilateral, and agglutinative. Sixty adult subjects (volunteers) viewed a videotape of 92 randomized Amer-Ind stimuli and recorded their interpretation of the meaning of each gesture. Responses for bilateral gestures were 29.67% correct; unilateral gestures were 20.69% correct; and agglutinative gestures were 13.17% correct. Scores for individual gestures ranged from 0 to 92% correct. These results suggest that Amer-Ind Code may not be as transparent as previous research has suggested, especially for unilateral and agglutinative gestures.

Speech-language pathology (SLP) maintains a vital interest in the process of communication including the use of compensatory strategies by individuals with little or no intelligible speech. One communicative strategy which has been used is Amer-Ind Gestural Code (Skelly, Schinsky, Smith, Donaldson & Griffin, 1975; Skelly, 1979). Amer-Ind is a gestural system which is based on American Indian Hand Talk and is advocated because, according to proponents, its

> low, symbolic level, ease of acquisition, flexibility, speed, lack of grammatical structure and rules, and use of concrete, demonstrable referents, ...enable the viewer to interpret without formal instruction... (Skelly, 1979, p. 7).

Many aspects of Amer-Ind Code have been scrutinized in the literature. Researchers have focused much of their attention of the question of Amer-Ind's ease of acquisition by persons with aphasia. Skelly (1979) reported that 12 of 20 aphasic patients (60%) successfully used Amer-Ind to express their needs after approximately 50 sessions. Guilford, Scheuerle & Shirek (1982) provided a combined total of four weeks of instruction in Amer-Ind and American Sign Language (ASL) to eight aphasic adults. Their subjects' mean scores for the two manual systems were 79% and 78%, respectively, for receptive skills (i.e., observing a gesture and selecting the corresponding picture from a field of four), and 59% and 63% for expressive gestural skills (i.e., looking at a picture and producing the corresponding gesture). The authors found no difference in ease of acquisition between Amer-Ind and ASL at the one word level, either receptively or expressively.

In contrast to Guilford et al (1982), Daniloff, Fritelli, Buckingham, Hoffman & Daniloff (1986) included both brain damaged and non-impaired adults as subjects. They concluded from their study that Amer-Ind gestures are easier to imitate and recognize than their ASL counterparts. Daniloff and Vergara (1984) concluded that Amer-Ind is motorically simpler to produce than ASL, based on the average ages at which an infant masters the handshapes required by the two systems.

The above examples illustrate that there is some ambiguity in the literature regarding the merits of Amer-Ind relative to ASL. However, there appears to be a consensus regarding the overall usefulness of Amer-Ind as a communicative system when it is viewed in terms of ease of performance and interpretation of single gestures by trained individuals (Daniloff, Lloyd & Fristoe, 1983; Kirschner, Algozzine & Abbott, 1979).

One important aspect of Amer-Ind is the claim that untrained viewers are able to interpret the gestures. A guesture's "guessability" is referred to in the literature as "iconicity" (Robinson & Griffith, 1979). Iconicity has been a focal point of research, although much of it has been specific to ASL rather than Amer-Ind. While pointing out that researchers have not established a universally accepted definition of iconicity, Orlansky and Bonvillian (1984) have defined an iconic sign as one that "bears a close resemblance to the object, action, or characteristic it represents" (pg. 287). Brown (cited in Griffith, Robinson & Panagos, 1981) stated that perception of iconicity is linked to time, culture, age, and experience. Similarly, Griffith and Robinson (1981) found that judgments of the iconicity of ASL varied by the viewer's age and experience with the signs. Bellugi and Kilma (1976) broke iconicity down into two components: transparency (the degree to which the meaning of the gesture is guessable to untrained viewers) and translucency (the degree to which the viewer who understands the meaning of the gesture is able to state the relationship between the gesture and its referent).

Debate continues over the role of iconicity in gesture acquisition and recall. Orlansky and Bonvillian (1984) found that iconic signs constituted only 30-34% of the signs used by young children of deaf parents. The authors concluded that iconicity was, therefore, not important to sign acquisition. However, interpretation of their results is hindered by the fact that we do not know the proportion of iconic to non-iconic signs that the children were exposed to in their environment. If the overall sign corpus that they observed contains significantly less than 30% iconic signs, we could then conclude that the children favored iconic signs by remembering them in greater proportion than the environment presented them. Also, as Lloyd, Loeding, and Doherty (1985) point out, this study considered only transparent signs and omitted translucent ones. They concluded "the percentage of signs bearing a relationship to their referent

was actually closer to 65% when both categories were combined..." (pg. 50). Poizner, Bellugi and Tweney (1981) found that iconicity did not aid deaf subjects in short-term recall of lists of ASL gestures. Loeding (1989) compared two types of sign training with normal college students: iconic explanations (cues regarding the signs' relations to their referents) and physical descriptions of sign formations. In her study, no significant difference in receptive or productive acquisition based on the type of training received was found. Kohl (1981) compared the acquisition of iconic versus non-iconic signs by severely handicapped children and reported that the results were "inconclusive."

In contrast, Konstantareas, Oxman and Webster (1978) concluded that iconicity aided autistic children in sign acquisition. Bellugi and Klima (1976) pointed out the fact that sign language manuals, as well as deaf individuals themselves, consistently provide cues as to the iconicity of signs when trying to teach them, indicating that there is a general tendency to expect iconicity to aid learning.

Regardless of its effect on acquisition and retention of signs, iconicity is essential to any sign system if it is to be understood by untrained viewers. As Skelly (1979) states, "If interpretation is achieved at a widespread level with the general public, ...integration of the communicatively handicapped person into society can be greatly facilitated" (pg. 4). However, despite the importance of transparency to Amer-Ind, very little research has been undertaken to verify Skelly's claim that the viewer does not need formal instruction to interpret the code. Skelly (1977, 1979) summarized a number of studies in which she assessed transparency. She found that Amer-Ind transparency generally fell between 80% and 88%. However, interpretation of her results is complicated by the fact that she provided "category cues" to some groups, which the untrained viewer in the patient's environment would be unlikely to have. Doherty, Daniloff and Lloyd (1985) found that such category cues significantly assisted the viewer's interpretation. After performing the same transparency tasks with "categorical subjects" (who were given cues) and "noncategorical subjects" (without cues), they concluded that "categorical subjects were only 9% more accurate than noncategorical subjects overall. However, their accuracy was enhanced by as much as 20 to 45% for particular categories of relatively more difficult gestures" (pg. 10).

Other studies by Skelly involved subjects who had prior experience with Amer-Ind. Daniloff, Lloyd and Fristoe (1983) pointed out that Skelly's research did not "incorporate (a) well defined and objective scoring criteria, [or] (b) scoring by objective judges..." (pg. 103). Daniloff et al (1983) designed a study which specifically addressed clarification of the Amer-Ind transparency issue. They presented the entire corpus of Amer-Ind gestures to naive viewers, with carefully controlled scoring criteria. Their results indicated that Amer-Ind is 42% to 50% transparent, in sharp contrast to the findings of Skelly's earlier research. They also ranked the individual gestures by transparency ratings and found that the gestures ranged from zero to 100% transparent. Kirschner et al (1979) presented 20 Amer-Ind gestures to naive viewers and found that 55% of the gestures were correctly identified. While this study included only a small corpus of gestures and did not specify scoring procedures, its findings are very similar to those of Daniloff, et al (1983).

In addition, there is a paucity of scientific inquiry into the effectiveness of agglutinations which Skelly defines as "putting together two or more signals to convey a concept not inherent in any one of the signals so used" (1979, pg. 102). The combined gestures may be connected by the PLUS gesture (the two index fingers crossed to form a plus sign). For example, in order to convey the concept "library," Skelly (1979) recommends the agglutination SHELTER PLUS READ (in keeping with convention, Amer-Ind stimuli will be written in all capital letters). Since many basic ideas can be expressed in Amer-Ind only through the use of agglutinations, their "guessability" is at least as important as it is for single-gesture concepts. However, little if any research has been done to date on the transparency of agglutinations.

Finally, there is a limited corpus of literature regarding the effectiveness of Amer-Ind when used by the hemiplegic patient. Skelly (1975) provided one-handed adaptations for all two-handed gestures. More recent authors have mentioned these adaptations, but their transparency has yet to be determined. Since many aphasics may receive training in Amer-Ind, and since many aphasics may also be hemiplegic or hemiparetic, the question is of no small relevance.

In light of the importance of Amer-Ind transparency and the need for additional pertinent research, this study addressed the following questions:

1. How transparent are Amer-Ind gestures when produced with:

   a) one hand (unilaterally) and

   b) two hands (bilaterally)?

2. How transparent are those agglutinative stimuli which convey concepts likely to be relevant to everyday life?

Method

Subjects - A total of 60 subjects participated in this study, including psychology students from the University of South Florida and other volunteers from the surrounding community. Non-students included staff from area nursing homes and volunteers from a local church. All stated that they had no prior experience with any gestural communication system and all reported normal visual acuity either with or without correction. Subjects ranged in age from 18 to 53 years (mean age 28.45 years). Educational background ranged from high school to the graduate level (master's degree).

Stimuli - The stimuli consisted of 92 Amer-Ind gestures culled from Skelly (1979) and from the Amer-Ind Video Dictionary (1975). The Amer-Ind Video Dictionary contained a total of 193 gestures from which to choose. The agglutinations were selected from 144 suggested agglutinations in the Skelly text. The present study included 36 bilateral gestures (B), their 36 unilateral counterparts (U), and 20 agglutinations (A). The non-agglutinative (single-gesture) stimulus items was selected if both one-handed and two-handed versions of that item were available. Six such items were excluded, either because they would appear later as components of an agglutination (WASH, BOX, ADD and IN) because the gesture was considered too outdated (TELEPHONE), or because no alternative meanings were given for use in conservative scoring (BEFORE) (see "Scoring" below). It was not feasible to control for the number of nouns and verbs in the corpus, since any given gesture may have a variety of suggested meanings representing several different grammatical forms. An agglutination was selected if a panel of three SLPs agreed that

it appeared likely to be relevant to everyday life. For example, items such as "microscope" would be omitted, while items such as "nurse" would be more likely to be included. The single-gesture items used in the study did not appear as components of an agglutination. All agglutinations represented single words. Unlike the single-gesture items which were each presented in unilateral and bilateral forms, the agglutinative items were presented only once. This was done in order to limit the corpus size and reduce potential subject fatigue. If an agglutination contained gestures which could be produced in either bilateral or unilateral forms, the bilateral form was chosen. For a complete listing of the gestures included, see Appendix A.

The 36 bilateral items, their unilateral counterparts, and the 20 agglutinations were assigned to two separate blocks. The first block contained a randomization of 10 agglutinations, bilateral items 1-19, and the unilateral versions of items 19-36. The second block contained an independent randomization of the remaining items. The six interrogative agglutinations were assigned evenly to the two blocks. Randomization was controlled such that no type of gesture (bilateral, unilateral, or agglutinative) would appear more than three times in a row. Randomization of the second block was further controlled so that no gesture appeared within 10 items of its counterpart in the first block. Subjects recorded answers for block one on the first pages of their response sheets and answers for block two on the second page. Subjects were given a five minute rest between the two blocks. This procedure was followed in order to ensure that no bilateral single-gesture item appeared in close temporal proximity to, or appeared on the same page as, its unilateral counterpart. It was felt that this procedure would minimize whatever learning may have occurred on the paired items.

A person with 10 years of experience with ASL (the experimenter) learned the Amer-Ind stimuli according to the Amer-Ind Video Dictionary (1975) and Skelly (1979). Where discrepancies occurred between the two sources, the videotaped version was chosen (see Daniloff et al, 1983). The experimenter performed the stimuli while seated in front of a dark background, wearing solid, dark clothing to maximize visibility of the hands. The visual field was large enough to include an area slightly above the experimenter's head and slightly below knee level. The hands were returned to a neutral position on the lap between each production of a stimulus, in order to delineate clearly the beginning and end of that stimulus. Each item was performed twice in a row, with two seconds in between. Twenty seconds of blank tape were left between each pair of stimuli.

Prior to subject viewing, the videotape was viewed by three SLPs who verified the accuracy of each item according to the Amer-Ind Video Dictionary (1975) and Skelly (1979).

Equipment - A Panasonic AG-180 color videocamera and a Sony Dynamicron ES VHS videotape were used to film the stimuli. The stimuli were displayed on a Magnavox RJ5552 27-inch color television.

Procedures - Subjects were seated at a maximum distance of 10 feet from the screen, with a maximum head turn of 30 degrees. Subjects were tested in groups of 1 to 10 people, due to scheduling constraints. All subjects reported that they had an unobstructed view of the screen before testing began. They were told to write whatever response seemed most appropriate to them, whether it was a single word, a phrase, or a sentence, and that they could write the same response for more than one stimulus if they felt that it was appropriate. Finally, they were told to make their best guess for every item and only to give an "I don't know" response if they were completely unable to guess. Subjects were instructed to record "I don't know" responses in the form of a question mark since any written words might be confused for an interpretation of the gesture.

During a previous, informal observation with a limited number of viewers, one individual had stated that he had not correctly interpreted the gesture for "eyeglasses" because he knew he was viewing American Indian gestures, and "Indians didn't wear glasses." To preclude this kind of problem in the formal study, it was decided that the subjects would not be told the name of the code nor were American Indians mentioned. (Experimental instructions are in Appendix B.)

Three examples were given to the subjects in order to acclimate them to the task, and they were asked again whether they had an adequate view of the screen. They were then presented the 92 test items. The upcoming stimulus number was given as a warning five seconds before each pair of stimulus items was shown to allow the subjects time to complete their responses and return their attention to the screen.

Scoring - Responses were divided into six categories. Responses which were correct according to Skelly's (1979) test were classified as "Correct-Conservative." (It should be noted that Skelly did not provide alternative meanings for the agglutinations; therefore, they were less likely than the other gestures to be interpreted as correct on a conservative scale.) Responses were scored as "Correct-Liberal" if (1) they differed from the target word and Skelly's suggested synonyms, but were listed as synonyms of the original target in Roget's Revised College Thesarus (1985), or (2) they were judged by majority decision of a panel of three SLPs to be synonymous with the target. The division of correct responses into conservative and liberal categories parallels the technique used by Daniloff et al (1983). In contrast with the scoring system they used, only synonyms for the original target word were accepted, rather than accepting synonyms for all of the alternative meanings provided by Skelly. This was decided because the alternate list presented a wide array of meanings, and acceptance of synonyms for all of them would have resulted in a set of acceptable responses so diverse and far-removed from the original as to be useless. For example, among Skelly's alternative meanings for the stimulus BOAT is the word "travel." Roget's Thesaurus lists "sleep-walking" as a synonym for "travel." If we had scored as liberally as did Daniloff et al, then "sleepwalking" would have been an acceptable interpretation for BOAT.

One other type of "correct" category was created in order to clarify scoring. This category included responses which contained the target word but added additional elements to the response which slightly restricted its meaning. An example of such a "Correct-Restrictive" response was "Put glasses on" for EYEGLASSES. In order to be included in this category, the response had to contain the target word and had to communicate the intent of this target without excessive restriction. The panel of SLPs judged whether or not the restriction was excessive.

Incorrect responses fell into three categories. Any guess which did not appear as a synonym of the target in either Skelly

(1979) or Roget (1985) was classified as "Incorrect." (This excludes the difficult cases which were taken before the committee, judged to be synonymous, and scored as "Correct-Liberal" as explained above.) A subcategory of incorrect responses was created for responses which contained the target word but excessively restricted its meaning. (An example of such a restrictive response is "close the door" for CLOSED.) The third incorrect category included question marks which were classified separately as "Don't know" responses.

Results

When scored across stimuli and stimulus types, the overall percent correct for all subjects was 20.67. This figure takes into account all three types of correct responses (conservative, liberal, and restrictive). Out of the total response set, 13.53% were conservatively correct, 6.12% were liberally correct, and fewer than 1% were restrictively correct. Error responses made up 79.33% of all responses, including 67.75% incorrect, 1.58% restrictively incorrect, and 10.01% "Don't know" responses.

Across stimuli, 29.67% of bilateral (two-handed) gestures were interpreted correctly. These correct scores were categorized as follows: conservatively correct, 21.62%, liberally correct, 6.94%, and restrictively correct, 1.11%.

Across stimuli, 20.69% of unilateral (one-handed) gestures were interpreted correctly. These correct scores were categorized as follows: conservatively correct, 12.50%, liberally correct, 7.65%, and restrictively correct, 0.55%.

Agglutinations (single concepts conveyed by combined gestures) were identified with the least success. Overall they were 13.17% correct: 10% correct conservatively, 1.92% correct liberally, and 1.25% correct restrictively.

Error responses were as follows: bilateral gestures - 63.01% "Incorrect," 1.94% "Incorrect-Restrictive," and 5.14% "Don't know." For unilateral gestures, overall percentages for errors were 65.97% "Incorrect," 1.30% "Incorrect-Restrictive," and 12.04% "Don't know." For agglutinations, error percentages were 79.50% "Incorrect," 1.33% "Incorrect-Restrictive," and 15.17% "Don't know."

The range of correct responses (including liberal and restrictive) began at 0% for ACCOMPANY (U), ADVANCE (U), AFTER (B), BETWEEN (U), BOTTOM (U), DEATH (B and U), DOOR (B), FRIEND (U), HALF (U), HARD (B and U), MEET (U), and the agglutinations TOILET, KLEENEX, BREAKFAST, LUNCH, TROUBLE, NURSE, HOW, WHERE, WHO and WHY. The range peaked with the gesture of AGREE (U) with 92% correct. Interestingly, 54 of the 55 correct responses for AGREE (U) were liberally rather than conservatively correct (i.e., only one response was conservatively correct). The mean percentage of correct response per stimulus (rather than across stimuli) was 12.41% with a standard deviation of 14.38%. A rank ordering of correct scores for individual bilateral, unilateral, and agglutinative Amer-Ind gestures are in Appendices C, D, and E, respectively. These data may help clinicians in selecting the most transparent gestures of each type for their patients. It should be noted, however, that this study did not assess the entire corpus of bilateral Amer-Ind gestures as did Daniloff et al (1983).

Of special interest is the overall lack of success in interpreting the agglutinations especially since these gestures often referred to basic needs. While agglutinations made up only 28% of stimuli, they comprised 48% of the gestures which were never interpreted correctly. Many subjects interpreted the agglutinative PLUS gesture to be a gesture of negation, and it was quite common for interpretations to be exactly the opposite of the intended meaning. For example, COFFEE (an agglutination of DRINK PLUS HOT) was interpreted to mean a request for a cold drink in 25% of responses. One potentially dangerous misunderstanding involved the gesture for TROUBLE which was interpreted in 17% of responses as a positive indication of well-being.

The potential for dangerous or embarrassing misinterpretations was evident also with non-agglutinative gestures. The gesture for BETWEEN was given a sexual connotation in 12% of responses with many subjects commenting afterwards that they had been "too embarrassed to write what they really thought it meant." The gesture for NURSE was often interpreted as a comment on a woman's figure (22%). Sexual interpretations were also given for the gestures ALIKE, FRIEND, and THANK. The gesture for HARD was interpreted in 33% of responses as anger or an intent to do violence.

Discussion

This study demonstrates an overall transparency level for Amer-Ind of 20.67%. This is much lower than the overall 42-50% transparency reported by Daniloff et al (1983) and the 55% reported by Kirschner et al (1979). This may be attributed to the fact that this study used less liberal scoring criteria by accepting only the target, its designated alternatives, or synonyms of the target as correct responses and excluding synonyms of the alternatives. This study also differed in the number of stimuli tested Daniloff et al (1982) tested 24 gestures; Daniloff et al (1983) tested 193 gestures; Daniloff et al (1986) tested 15 gestures; and Guilford et al (1982) and Kirschner et al (1979) each studied 20 gestures. The present study, therefore, presented a greater number of distinct stimuli (92) than did many other studies. This study also differed in that both the unilateral and agglutinative forms were also tested. The greater number of stimuli, the use of all available stimulus types, and the less liberal scoring may give the present study increased validity.

This study did provide some constraints which may have lowered subject performance relative to their potential performance in an Amer-Ind conversation. First, there was careful exclusion of single-gesture items which would later appear as part of an agglutination. This might have unrealistically limited the subject's chances to learn the stimulus items. In an actual conversation, such screening out of gestures would not have occurred, and multiple exposure might have increased comprehension. It would be interesting to explore the possibility that comprehension might be enhanced by multiple presentations of the stimuli even in the absence of feedback. In this study, as in all studies referenced herein, subjects were unable to ask for clarification as they could in an actual conversation. Finally, the presentation format did not allow the subjects to see the gestures in context, and the resulting lack of contextual cues may have reduced comprehension relative to an actual communicative attempt.

Since comparison of Amer-Ind with ASL is relatively common, a logical question for future research might be how the transparency of agglutinative Amer-Ind gestures compared to ASL signs for the same

concept. For example, how transparent is the ASL sign for "flower" compared to the Amer-Ind agglutination GRASS PLUS UNFOLD PLUS COLOR? When ASL users combine gestures, how transparent are these combinations compared with Amer-Ind agglutinations? Compared to ASL, how much does an Amer-Ind conversation depend on the use of agglutinations?

The motoric constraints of agglutinations compared to their ASL counterparts should also be explored as an expansion of Daniloff and Vergara (1984). Is it motorically easier to produce Amer-Ind agglutinations such as MAN PLUS PROTECT PLUS BABY that it is to sign the ASL counterpart "father?"

The basic assumption underlying the use of agglutinations also needs to be addressed; namely, that a concept can be conveyed effectively by simply combining other related concepts. Written agglutinations could be presented to subject who would then be asked to guess the meaning. Results would tell us if QUESTION PLUS PERSON really translates to "who" or if TEETH PLUS OBJECT clearly means "dentures."

If abstract combinations such as BOX PLUS LOOK PLUS LISTEN really do communicate the intended concepts (in this case, "television"), do they maintain the "low level of symbolism" which is so vital to many aphasic patients (Skelly, 1979)? Transparency studies of agglutinations, using aphasic patients as subjects, may provide some insight. Daniloff et al (1986) compared non-impaired subjects with aphasic subjects on recognition of untrained gestures. They found no significant difference between mild aphasics and the normal controls; however, they found that severe aphasics performed at a significantly lower level than the non-impaired subjects. It would be interesting to see if replication of the study, using agglutinations instead of single-gesture items, would demonstrate similar results, or if the mildly impaired aphasics would show poorer performance relative to unimpaired subjects.

Logically, the question of acquisition of agglutinations by aphasics will also need to be addressed. Since agglutinations require a greater amount of time and a greater number of movements to execute than single-gesture items, they may be beyond the capabilities of some patients who are impaired in memory.

Another potentially interesting study might be performed to see if the use of the name "Amer-Ind" consistently restricted the response set as it did in our informal observations. While uninformed viewers in everyday settings would be unlikely to know the name of the system, knowledge of its name might confound transparency studies.

It was not the purpose of this study to imply that Amer-Ind Code lacks usefulness as a gesture system. To do so would be to fly in the face of current research and clinical findings. Amer-Ind has proven itself as a useful communicative tool for people with little or no intelligible speech. However, results of this study and the studies cited herein indicate that the code is not as transparent as was originally asserted, especially when agglutinations and one-handed gestures are used. It is evident that the question of Amer-Ind's transparency has yet to be truly answered. Until it is, clinicians cannot assume that by teaching Amer-Ind they are truly teaching the system most suited for "integration of the handicapped person into society." The clinician might find it advantageous to choose gestures from a number of systems, perhaps using Amer-Ind's single-gesture items which have proved to be highly transparent, using ASL for concepts that would have required agglutinations in Amer-Ind, and using pantomime for concepts not readily communicated by formal systems. This pragmatic approach seems more likely to meet the needs of the individual than would strict adherence to any one system.

Summary

This study sought to determine the transparency of Amer-Ind Code by examining naive subjects' interpretations of two-handed (bilateral), one-handed (unilateral), and agglutinative (combined) gestures. Overall correct scores for these three types of gestures were 29.67%, 20.69%, and 13.17%, respectively. This represents a lower level of transparency than previous studies found. Compared to previous studies, this study presented a relatively large corpus of gestures, presented a greater variety of stimulus types, and utilized less liberal scoring criteria. These factors were intended to indicate the transparency of the Amer-Ind Code.

Based on the results of this study, the following conclusions were reached:

- Bilateral Amer-Ind gestures, identified at just under 30% correct by normal adults, appear to be only minimally transparent.
- Unilateral gestures, at 20.69% transparency, appear to be only negligibly transparent.
- Agglutinative gestures, at 13.17% transparency, appear to be nearly opaque.

This study did not find, however, that Amer-Ind lacked usefulness as an augmentative/alternative communication aid. Rather, it assessed overall transparency across the 92 selected Amer-Ind items as well as the transparency of each individual item. It also provided a rank ordering of the gestures based on their transparency which may assist clinicians in choosing which gestures to incorporate into a patient's gesture/sign corpus.

Suggestions for Future Research

A number of questions were raised by this study, including the following suggestions for future research:

- Do transparency scores increase when the viewer is given multiple exposures to the target even in the absence of feedback? This study would shed light on the viewers' ability to learn to understand the code without formal training.
- Do transparency scores increase when the target gesture is presented within a sentence context? Videotaped role-playing scenes should be presented to subjects to assess the effects of context on comprehension.
- How transparent are Amer-Ind agglutinations compared to ASL signs for the same concept? A study could utilize separately randomized blocks of ASL and Amer-Ind productions of the same concepts presented to the same viewers in a transparency task.
- What are the motoric constraints for the production of Amer-Ind agglutinations compared to their ASL counterparts? This study would be a valuable complement to Daniloff & Vergara (1984).
- Are agglutinations acquired by aphasics as readily as single-gesture items? This study would be related to the above-mentioned study of motoric constraints and could provide insights not only into the value of agglutination, but also additional insights into the effects of motoric constraints on sign/gesture acquisition.
- How do aphasics perform on trans-

parency tasks involving agglutinations? A valuable study could look at mildly impaired aphasics to determine if their responses are similar to the responses of non-impaired subjects as they were in Daniloff et al (1986) which used single-gesture items.

• Can concepts be readily conveyed by combining related gestures (i.e., does GRASS PLUS UNFOLD PLUS COLOR really translate to "flower")? Written agglutinations should be presented to subjects in order to eliminate the necessity of gesture recognition.

• Are transparency scores adversely affected by subjects' knowledge that they are viewing "American Indian" gestures? This study would utilize separate groups of subjects identical except for their knowledge of the gestures' Indian origins. Exit interviews should be performed to investigate the subjects' decision-making processes.

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APPENDICES

APPENDIX A
RANDOMIZATION ORDER OF AMER-IND GESTURES

1. Peel (B)
2. Afraid (U)
3. Breakfast (A)
4. Bottom (U)
5. Meet (U)
6. Advance (U)
7. Kleenex (A)
8. Across (B)
9. Boat (B)
10. Closed (B)
11. Toilet (A)
12. Shoe (A)
13. Hang (B)
14. Door (B)
15. Between (U)
16. Fast (B)
17. Bowl (B)
18. Straight (B)
19. Why (A)
20. Agree (U)
21. Lunch (A)
22. Break (U)
23. Death (U)
24. Coffee (A)
25. Erase (U)
26. Hard (B)
27. Exchange (B)
28. Alike (B)
29. Nail File (U)
30. Who (A)
31. Room (A)
32. Cards (U)
33. Friend (B)
34. After (B)
35. Half (U)
36. Open (B)
37. Expand (B)
38. Enter (U)
39. ?????
40. Just (B)
41. Thank (U)
42. Accompany (U)
43. Differ (B)
44. Above (U)
45. How (A)
46. Below (U)
47. Spouse (A)
48. Trouble (A)
49. Death (B)
50. Bowl (U)
51. Afraid (B)
52. Thank (B)
53. Exchange (U)
54. Nail File (B)
55. Between (B)
56. Break (B)
57. Television (A)
58. Advance (B)
59. What (A)
60. Bath (A)
61. Boat (U)
62. Where (A)
63. Expand (U)
64. Just (U)
65. Above (B)
66. Cards (B)
67. Accompany (B)
68. Hang (U)
69. Dentures (A)
70. Differ (U)
71. Erase (B)
72. Glasses (B)
73. Open (U)
74. Across (U)
75. Peel (U)
76. Below (B)
77. After (U)
78. Friend (U)
79. Agree (B)
80. Closed (U)
81. Half (B)
82. Straight (U)
83. Meet (B)
84. Enter (B)
85. When (A)
86. Alike (U)
87. Nurse (A)
88. Bottom (B)
89. Door (U)
90. Radio (A)
91. Fast (U)
92. Hard (U)

(A) refers to an agglutination
(B) refers to the bilateral version
(U) refers to the unilateral version of a gesture

APPENDIX B
EXPERIMENTAL INSTRUCTIONS

INSTRUCTIONS: You will be taking part in an experiment which involves watching gestures on a video screen. Please inform the experimenter now if you think you will have difficulty seeing the monitor. Once the test is started, items cannot be repeated.

You will be presented 92 utterances. Your task will be to try to discern what the signer is communicating to you. Each item will be presented twice in a row. For example, if the signer is saying "elephant," you will see "elephant, elephant." Some of the utterances are made up on more than one gesture, so it is important to watch until the item has been presented completely. Please watch both complete presentations of each gesture before writing your response in the blank provided.

Write whatever response seems most appropriate to you, whether your response is a single word, a phrase, or a sentence. You will be given a maximum of 20 seconds to respond.

Please do not leave any spaces blank. Make your best guess for each gesture. If you absolutely cannot guess, then write a "?." You may write the same response for more than one gesture if you feel that is appropriate. For example, if the first gesture you see and the 45th gesture you see both make you think of an elephant, then write "elephant" for both.

I will warn you five seconds before the next gesture appears so that you can complete your response and turn your attention to the screen. (WARN THEM BY TELLING THE UPCOMING ITEM NUMBER.)

You will now see 3 examples. Please recall that each gesture is presented twice. After watching both presentations, write your responses in the appropriate blanks under "examples." Are there any questions? SHOW THE EXAMPLES.

DOES ANYONE NEED TO MOVE FOR A BETTER VIEW?

ARE THERE ANY QUESTIONS?

WE WILL NOW SEE THE 92 GESTURES.

APPENDIX C

RANK ORDERED CORRECT TRANSPARENCY SCORES FOR BILATERAL STIMULI

BILATERAL STIMULUS	TOTAL CORRECT	% CORRECT	CORRECT CONSERVATIVE	CORRECT LIBERAL	CORRECT RESTRICTIVE
BREAK	52	86.67	44	0	8
CARDS	48	80.00	40	8	0
GLASSES	47	78.49	35	0	12
AFRAID	40	66.67	39	1	0
PEEL	37	61.67	37	0	0
MEET	34	56.67	15	19	0
HANG	32	53.33	20	12	0
ACROSS	31	51.67	1	30	0
EXPAND	29	48.33	9	20	0
OPEN	29	48.33	28	0	1
BETWEEN	28	46.67	24	4	0
NAIL FILE	26	43.33	26	0	0
THANK	24	40.00	24	0	0
ERASE	21	35.00	20	1	0
BELOW	20	33.33	17	2	1
ACCOMPANY	18	30.00	0	18	0
ENTER	17	28.33	1	16	0
STRAIGHT	17	28.33	16	1	0
BOWL	13	21.67	7	6	0
FRIEND	12	20.00	10	2	0
BOTTOM	11	18.33	11	0	0
ADVANCE	10	16.67	7	3	0
EXCHANGE	7	11.67	2	5	0
ABOVE	6	10.00	5	1	0
DIFFER	6	10.00	6	0	0
FAST	6	10.00	6	0	0
HALF	6	10.00	3	1	2
AGREE	4	6.67	0	4	0
BOAT	4	6.67	4	0	0
CLOSED	4	6.67	4	0	0
JUST	4	6.67	3	1	0
ALIKE	3	5.00	3	0	0

APPENDIX D
RANK ORDERED CORRECT TRANSPARENCY SCORES FOR UNILATERAL STIMULI

UNILATERAL STIMULUS	TOTAL CORRECT	% CORRECT	CORRECT CONSERVATIVE	CORRECT LIBERAL	CORRECT RESTRICTIVE
AGREE	55	91.67	1	54	0
EXPAND	50	83.33	18	32	0
GLASSES	39	65.00	30	0	9
ACROSS	30	50.00	2	28	0
CARDS	28	46.67	12	16	0
BELOW	25	41.67	24	1	0
PEEL	25	41.67	24	0	1
AFRAID	23	38.33	23	0	0
CLOSED	22	36.67	22	0	0
ERASE	22	36.67	20	2	0
HANG	18	30.00	7	10	1
OPEN	18	30.00	18	0	0
BREAK	15	25.00	15	0	0
DIFFER	14	23.33	14	0	0
BOWL	10	16.67	1	9	0
ABOVE	8	13.33	6	2	0
EXCHANGE	8	13.33	6	2	0
AFTER	7	11.67	6	1	0
NAIL FILE	7	11.67	7	0	0
FAST	6	10.00	3	2	1
ENTER	4	6.67	0	4	0
THANK	4	6.67	4	0	0
STRAIGHT	3	5.00	2	1	0
BOAT	2	3.33	2	0	0
DOOR	2	3.33	2	0	0
ALIKE	1	1.67	1	0	0
JUST	1	1.67	0	1	0

APPENDIX E
RANK ORDERED CORRECT TRANSPARENCY SCORES FOR AGGLUTINATIONS

AGGLUTINATION STIMULUS	TOTAL CORRECT	% CORRECT	CORRECT CONSERVATIVE	CORRECT LIBERAL	CORRECT RESTRICTIVE
WHEN	12	20.00	0	12	0
SHOE	11	18.33	1	1	9
BATH	9	15.00	1	8	0
DENTURES	6	10.00	4	0	2
TELEVISION	6	10.00	4	0	2
COFFEE	1	1.67	0	0	1
ROOM	1	1.67	0	1	0
SPOUSE	1	1.67	0	0	1
WHAT	1	1.67	0	0	1

Perspectives on the Future of Professional Training in Speech-Language Pathology

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Florida has always been a leader in setting future trends for the professions of speech-language pathology and audiology. At this juncture in history as many segments of both professions discuss and debate our future directions, it is only fitting that Floridians once again have a loud voice in these conversations. In late February of 1996 a small but distinguished meeting occurred at the University of Florida. The focus of this meeting was on the future of professional preparation of speech-language pathologists. Five speakers (four of whom were Floridians) presented and discussed present and future issues with an audience representing all but one of Florida's university-based programs in speech-language pathology. This collection of manuscripts represents the written versions of the presentations shared at that meeting. While written versions fail to capture the emotion of each presentation or the interaction between presenter and audience, they do permit a more widespread distribution of information. And if we are serious about implementing change, we will require a ground-swell of support from all sectors to advise and guide this change.

Change? Why is change important? The answer is apparent throughout these written manuscripts. More to the point, the answer is apparent to the casual observer of our daily professional lives. The content and job skills necessary for present and future practice have changed dramatically in recent history and are changing still. In case you are wondering, these changes apply equally to the professional based in the educational system, the professional based in the healthcare delivery system, and the private practitioner who may transcend both worlds.

To introduce the concepts, let me introduce the speakers and their respective topics. **Malcolm "Mick" McNeil** (the only non-Floridian...but secretly wishes he were one) is the chair of the Education and Standards Committee of the Academy of Neurogenic Communication Disorders and Sciences. Incidentally, he is also the chair of the Department of Communication Science and Disorders at the University of Pittsburgh. Mick feels strongly that our profession should move to the doctoral entry level. His position is that we all have too much to learn to accomplish the task of professional preparation. His credo has become..."the highest level of competence is the minimum required." This is a compelling argument. His commentary is thought provoking. **Michael Groher** is well known to most Floridians and to all "swallowologists." Mike is a member of the SID 13 board and participated in the consensus conference on Medical Speech-Language Pathology. Specialization is a hot topic in our profession...we have seen extensive growth in the provision of services in healthcare settings...is specialization in "medical speech pathology" a future reality? Mike's presentation was intended to inform participants of the activities of the committee formed to evaluate issues surrounding "medical speech-language pathology." **Betsy Vinson** is the Director of Clinical Education in the Department of Communication Processes and Disorders at the University of Florida. To all who know her, Betsy is a dedicated, bright, and hard working individual. She has the difficult task of balancing requirements from ASHA to available clinical opportunities for her students.., and, in consideration of the skills these same students will need for their professional futures. From this perspective, Betsy discusses present and future trends in graduate education. I, **Michael Crary**, was assigned the interesting task of addressing how we might provide pertinent information to practicing clinicians and how we might make this system more efficient in the future. My conclusions are that we should consider changing how we educate/train future professionals and make relevant training opportunities readily and easily available to current professionals. Again, I support change. Last, but by no means least, **Leslie Gonzalez Rothi** reviews the purposes and functions of the specialty recognition board of ASHA. Leslie always makes a compelling argument and don't expect less in her words on this issue. Leslie has been active in specialization issues as long as I have known her. She is a dedicated professional who wants the best for her patients and her students. Her presentation, though objective, may be a road map for the future. Many believe that specialization will be a fact of our professional future.

The meeting was highly stimulating and I've received many inquiries since that meeting either requesting information or offering assistance. The next step is to be decided. If you have an opinion, a point of view, or are willing to assist in some way, I ask that you contact me. Don't let your future be decided for you. Be active! Be a part of what is to come. My address is Box 100174, UFHSC, Gainesville, Florida 32601. I look forward to hearing your thoughts.

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Professional Education in Communication Science & Disorders

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In this presentation, I will address professional education in communication sciences and disorders by addressing: (1) the political factors governing the practice of Audiology & Speech-Language Pathology; (2) the necessity of resisting the political factors; (3) the professional fear of change; and (4) the real threat of reducing the denominator. In addition, I will address: (a) the level of competence necessary for professional practice; (b) a premise of a plan for the future (i.e., the MA is OK but a doctoral degree will set us free); (c) the arguments against a doctoral entry-level for practice; and finally, (d) a curriculum for a clinical or research doctorate in neurologic communication sciences and disorders.

There are a number of political factors governing the practice of audiology and speech-language pathology. Not the least among these factors is the influence of the Pew Commission's recommendations concerning the structure and function of disciplines engaged in habilitation and rehabilitation. They have suggested that "cross training" individuals so as to be able to manage all services involved in rehabilitation such as clinical psychology, neuropsychology, occupational therapy, physical therapy, speech-language pathology, audiology, social work, nursing, etc. would improve service delivery, reduce healthcare costs and improve the overall effectiveness of treatment.

From my point of view, if this laudable goal were seriously pursued, it would be bound for diminished service delivery and an increase in healthcare costs because of decreased efficiency and effectiveness of treatment. If case managers are the goal, there are a number of established models that are effective. Attempting to train the "super-rehabilitationist" would prove as ineffective as it has in the past. The complexity of each profession mitigates the effective training of an individual that can manage more than a small portion of the systems necessary for effective and efficient clinical management of even the simplest cases. Medicine's attempt to train the rehabilitation physician (the physiatrist) to manage a team of rehabilitation specialists appears to have been evaluated as a failure given the Pew Commission's latest recommendations. Indeed, there is an important role for the rehabilitation physician (the physiatrist or the rehabilitation neurologist); however, their training does not prepare them to manage the variety of patient needs that are represented by the various disciplines involved in the process any better than does any one of the other disciplines. Again, the complexity of each system represented by the various disciplines and professions makes unlikely or impossible that an individual could ever manage all of the social, psychological, neurological, physiological, communicative impairments that bring the patient to the healthcare (or educational) system for habilitation or rehabilitation.

The American Speech-Language Hearing Association (ASHA) has recently approved the suggested guidelines for the use of "Speech Aides." The justification for this action is that they are already being used, need to be regulated, and standards for their training and certification need to be established and regulated. The service that these individuals will be allowed to provide under the ASHA plan, with 20% or 30% supervision, is a direct threat to care that communicatively impaired individuals require. In my view, the delivery of treatment is a very complex enterprise that almost always requires on-line decisions about stimulus selection, schedules of knowledge of results, reinforcement types and schedules, timing of these and other variables as well as an atmosphere of trust and social interaction that few individuals can learn in the time it takes to get a master's degree. The proposed two years of training beyond high school cannot produce the minimally prepared individual to meet the dynamic challenges of the treatment process. I cannot imagine a clinician-administered treatment that could or should be administered by such an individual, even the simplest "drill" type of therapy. Although we, like most other disciplines in the healthcare industry, do not have sufficient data to demonstrate that treatment administered by such individuals will reduce the efficiency or effectiveness of treatment outcomes, "best practices" should dictate that they should not be used until such evidence is supplied. These data should indicate unequivocally that they can produce treatment results comparable to the clinician trained to the standards of the discipline and the profession. The widespread adoption of speech aides and their endorsement by the ASHA should be viewed as a serious threat to discipline, the profession and to the individuals they treat until such time that they are demonstrated to be competent to practice the profession to the standards that the

licensed professionals provide.

There are so many configurations to Health Maintenance Organizations and insurance company reimbursement policies that it is difficult to make general statements about the impact of them on the practice of speech-language pathology and audiology. Nonetheless, the universal problems of capitation and generally restricted reimbursement for our services has already reformed many practices. Where this will eventually lead is anyone's guess; however, it is clear that healthcare reform threatens delivery of speech-language pathology services to many of the individuals that need it. Consumers will undoubtedly eventually determine the levels of acceptable service in terms of duration and overall effectiveness, but until the time that they can influence this process, inappropriate models of service delivery will continue to be imposed on our practices and the need for extended periods of rehabilitation for some will continue to be limited to the proverbial six sessions. An active political agenda for Communication Science and Disorders at the academic and service delivery levels is essential to the provision of services. Continued and expanded political vigilance from state and national organizations will be required for the effective delivery of services and even for the survival of many practices.

One consequence of healthcare reorganization that has already been realized is the progression of practice toward the lowest common denominator. One prominent example of this explicit trend was recently expressed by Jeffrey Romoff, president of the University of Pittsburgh Medical Center. Responding to the trend toward having individuals with less training and lower credentials assuming the healthcare duties of individuals traditionally assigned and licensed to carry on these services, he was quoted by the *Pittsburgh Post-Gazette* as saying that "As long as there's another hospital that's willing to cross the line, the one that isn't willing to cross the line runs the risk of losing business." [*Pittsburgh Post-Gazette*, Sunday, February 11, 1996]. Quality healthcare aside, finances not only drive, but decide who is in the passenger's seat. This acknowledged and sanctioned trend must not be allowed to progress or even stand at its current levels.

The required physician authorization for third-party reimbursement for many if not most procedures performed by speech-language pathologists (e.g., Medicaid and Medicare reimbursable patients) remains a cost to the system and at times an impediment to the independent practice of speech-language pathology and audiology. This politically charged issue will remain as such until such time as the independence of practice of speech-language pathology reaches a maturity that warrants the public trust given to truly independent practitioners.

As mentioned above, there are several important factors that influence the practice of speech-language pathology and audiology. Likewise, there are several factors that will require our expanded attention in order to preserve our ability to offer quality services. One other factor that can have a profound influence on the political, economic and public trust is the true and perceived competence of the individuals providing the service. This issue will be addressed below.

What Level of Competence is Needed for Clinical Practice?

The answer to this important question is not philosophically simple; however, the only reasonable answer from a consumer point of view has to be that the minimum required is "the highest level of competence possible." Another way to ask this question is "Which pathological conditions can be assessed or treated with less than the minimally competent clinician?" Alternatively, the question might be asked "Which persons don't need or deserve the minimum competent clinician to provide service to them?" Again, from my point of view as service provider, as an academic charged with training the competent service provider, and as a consumer, the highest level of competence possible is the only acceptable answer to this question. Of course there are economic constraints on the provision of service as well as on the training of service providers. These limitations cannot be used to justify the training of speech-language pathologists or audiologists that are trained below the level of the best that they can be. No client or patient deserves to have other than the best that the discipline and profession can provide. Very few assessment, diagnostic or treatment procedures are simple enough to justify their delivery by anyone other than a highly trained professional. Those that do can generally be computerized.

Who are these highly trained professionals? At present the professionally accepted and licensed individual holds a minimum of a master's degree, has completed a Clinical Fellowship Year (CFY), and has successfully passed a national examination. However, I will advance the argument that the master's degree-level training is "inadequate" for independent clinical practice. The reasons are that we cannot acquire the minimum information necessary to enter Speech-Language Pathology or Audiology in the time allotted in the typical two-year master's degree program following a liberal arts undergraduate program in which a maximum of two years is dedicated to coursework within the discipline. The knowledge base and scope of practice has become so broad and so deep within the past ten to 15 years that it is no longer possible to be minimally trained to enter a general practice with the amount of didactic and clinical training possible to obtain in the time period offered by the master's program. Further, because of the likely shift of cases traditionally managed within the healthcare system to the educational institutions, we should not consider providing for a differential level of training based on employment setting (e.g. educational based practices). There is not likely to be "simple" or "easy" clinical cases based upon employment setting (not that it ever was) that will justify a differential level of training for the practicing clinician.

There are, and have been, arguments against the doctorate as the entry-level for the clinical practitioner. Wertz, for example, has argued that because only 4.8% of ASHA members hold a Ph.D. (93.8% hold a master's degree), it would be impractical to require a doctorate as the entry-level. He further argues that certification is about improving the quality and quantity of quality services and that if practice is restricted to the 5% doctoral-level practitioners, we exert no influence over quantity of quality care. He goes on to argue that there is no evidence that master's-level clinicians are less competent than doctoral-level clinicians and that "requiring a doctorate as the entry-level is unnecessary and restrictive." Quoting Toeffler, Wertz justifies the maintenance of the master's-level degree as the entry-level for clinical practice. He says: "Toeffler reminds us our responsibility is not to stop the future but shape it...and to ease the trauma of transition. If we do this thing right, we will provide the best services for all who need those services. Doing that seems more a matter of competence than degree."

I agree with Wertz' argument that there are not enough doctoral-level individuals to manage the clinical enterprise. However, I disagree with the implication that that is a sufficient reason to refrain from raising the entry-level if it is justified in other ways. Indeed, there weren't enough master's-level practitioners available with the master's degree was deemed necessary for clinical practice, leaving the bachelor's-level clinicians behind. Sufficient doctoral-level practitioners have not been available for any profession when it was first deemed necessary from a previous lower degree, with psychology providing an excellent example. Grandfathering into practice (but not the newly established entry-level degree) those currently certified and/or licensed to practice is the accepted and reasonable method for maintaining service during the time taken to establish the pool of qualified providers under the new requirements.

Wertz further argues that certification is about improving the quantity of quality services. Whether or not credentialing is about improving the quantity of services is not at all clear to me, but it is clear that it is about improving the quality of services. While many can site anecdotal evidence that a particular individual with a master's degree is as good or better than a specific doctoral-level clinician, the exception does not in this instance provide the rule. Doctoral-level individuals in Communication Sciences and Disorders are not routinely trained as expert clinicians but they could be. Further, while a doctorate does not guarantee that an individual will be better than an individual master's-trained individual, under most conditions that I can imagine, that individual would be considerably better than they would have been without the additional training. This, of course, is to no small measure dependent on the specific training at the doctoral-level, a point to be discussed below. While competence cannot be guaranteed with a doctoral-entry level, it is an insurance policy that would provide the perceived and real additional competence required for the efficacious, independent practice of the profession. It is, in my view, a matter of fact that the practice of the discipline has become so sophisticated and complex that the training possible at the master's level is inadequate. Our clients/patients deserve better and the profession may require it for its competitive survival. The subdiscipline of Audiology has recognized that inevitability and Speech-Language Pathology is certainly no less complex or in need of the political armor that will be provided by the doctorate as the entry-level for clinical practice.

A Clinical or Research Doctorate in Communication Science & Disorders

In my view, the training could/should/would be similar to the current Ph.D. with the addition of clinical training under the supervision of master clinicians. In this curriculum, research performance should be replaced with demonstrated critical (consumer) research analysis skills. Further, if 2000 hours are now spent doing research in the training of the research Ph.D., then 2000 hours should be spent doing clinical training in the clinical doctorate. I would also propose that the current CFY be encompassed as part of this clinical training. In general, I would see the didactic training to be quite similar to the research doctorate (again, with the exception of having to produce research being replaced with an emphasis on being expert consumers of research). One possible model for the curriculum might include the following working document drafted primarily by a former Academy of Neurologic Communication Sciences and Disorders Committee on Education and Standards.

A CLINICAL or RESEARCH DOCTORATE IN NEUROLOGIC COMMUNICATION DISORDERS: Knowledge domains and competencies (not all gained at the doctoral level)

- Prerequisites:
  - Human Anatomy
  - Physics
  - Human Physiology
- Bases of Normal Communication
  - Basic Science
    - Neuroscience
      - Neuroanatomy, including Neuroembryology
      - Neurophysiology
      - Neuropharmacology
      - Genetics
  - Applied Science
    - Psychology
      - Cognitive Psychology
      - Developmental Psychology
      - Aging
      - Visual Cognition
  - Language
    - Language/Linguistics
    - Language Acquisition
  - Speech
    - Speech Motor-Sensory Control, i.e. Speech Science, Speech Physiology (physiological phonetics)
    - Speech Acquisition
    - Acoustic Phonetics
    - Articulatory Phonetics
    - Transcription Phonetics
- Bases of Abnormal Communication
  - Neurological Disease
  - Neuropathology
  - Normal and Abnormal Anatomy
  - Cognitive Disorders
  - Perceptual Disorders
  - Psychiatric Disorders
  - Speech/Language Etiologic Differential Diagnosis
  - Speech/Language Disorders Differential Diagnosis
- Neurologic Bases of Dysphagia Management
  - Treatment of Speech Disorders
  - Treatment of Language Disorders
  - Treatment of Cognitive Disorders
  - Patient and Family Counseling
- Methods of Clinical and Laboratory Examination and Research
- Medical Examination and Special Tests
  - General Medical History and Examination
  - Neurologic History and Examination
  - Neurophysiological and Neuroaudiological Tests
- Speech, Language, and Cognitive Tests
  - Speech and Nonspeech Tests
  - Language Tests
  - Cognitive & other Neuropsychological Tests
  - Perceptual Tests
- Instrumentation and Computers
  - Clinical Instrumentation

- Computer Science
- Research
  - Research Design
  - Statistics
  - Technical Writing

In summary, WE MUST RESIST cross training as a substitute for competence or specialization, the economic arguments against competence as the entry level, the fear of current practitioners losing their ability of practice with their current credentials, and last but not least, the adoption of speech aides as proposed by the ASHA. The development of a clinical doctorate in Speech-Language Pathology is a necessary development in the profession. It is necessary for the minimal competence required for clinical practice and for the multitude of political influences that are brought to practice and even survival of the profession. Its time has come, and as Toeffler said, our task is not to stop the future, but to shape it and ease the burden of the transition. The development of the discipline and the political forces that influence the profession make the clinical doctorate necessary for the future of clinical speech-language pathology.

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Report on a Consensus Conference in Report on a Consensus Conference in Medical Speech-Language Pathology

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The conference was held in Minneapolis, Minnesota, July 7-9, 1995. The conference attendees were from ten of the special interest divisions (SIDs) of the American Speech-Language-Hearing Association (ASHA) including representatives from language, neurogenics, voice, dysphagia, administration, and augmentative communication. Thirty people were in attendance: 15 from hospitals, five from clinics, and 10 from university settings.

Prior to the conference, representatives from each of the SIDs met and considered the following issues in planning the meeting agenda: (1) to meet to advance training in the specialty area of medical speech-language pathology (MSLP); (2) to avoid lengthening the educational programs in speech-language pathology; (3) to prevent barriers from developing among specialty areas in the practice of MSLP; (4) to explore the demands for multi-skilled professionals in medical areas of practice; (5) to discuss the training needs for advanced practice in MSLP; and (6) to discuss the need to establish competencies for the speech-language pathologist (SLP) practicing in a medical setting. From this list a conference agenda was formed that focused on three major areas: professional competencies, models for training and expanding the possibilities in MSLP.

The conference began with participants attempting to define what the practice of MSLP meant to them. A working definition was "those aspects of SLP that address patient health and safety in addition to communication disorders." There was general agreement among the attendees that practitioners need to have a better understanding of medical concepts as they relate to their patients in both adult and pediatric settings. Members met in small groups to further define the problem and to discuss the issue of whether or not specialty certification in MSLP was necessary or desirable. To answer this question, each SID represented reviewed the survey results obtained from their membership asking for feedback on this issue. A summary of the responses indicated that members were concerned about the costs of additional training and certification that would be a part of specialty certification in MSLP. Membership also was concerned that the current training received at the master's level was not preparing students to meet their clients' health and safety needs as part of their communication and/or swallowing disorder. A third area of concern was that university programs often were not equipped to teach newer technologies that impact the health, safety and communication needs of patients treated in medical environments. It also was felt that the SLPs role in the medical setting was not well recognized by other members of the healthcare team, or by the lay public. There was consensus that as the scope of practice for the SLP continues to change, the care of the patients' health and safety also must change. Both new trainees as well as experienced clinicians are finding that there are new competencies associated with their jobs that go well beyond their training at the master's level and frequently beyond the completion of the clinical fellowship year (CFY). There was recognition that both new and practicing clinicians need to have access to this knowledge and achieve a competency base that is both timely and cost effective. There is a need to provide competency-based training for those practitioners who have been working in non-medical settings who are now entering medical settings because of the favorable job market. A matter of concern to representatives of this conference was whether or not we can provide this medically-based training in all areas of healthcare services in a reasonable time and for a reasonable cost. Specialty recognition may be desirable in some areas where competency is needed to meet life support demands and prevent patient harm.

SID members then met separately in their respective groups to construct basic outlines for defining the knowledge and competencies needed in each area of their practice. An example of the contents of such an outline is presented for the swallowing SID. This division thought that those people who were entering a medical setting should have the following basic coursework with associated practicum: neurolinguistics; speech and language development to include interrelationships between culture, cognition, communication, and swallowing across the entire lifespan; basic principles of behavior; psychometric testing and observational assessment; biomedical instrumentation procedures appropriate to the diagnosis of cognitive, communication, and swallowing disorders; courses in interviewing and counseling; courses in anatomy, physiology, and the neurology of communication to include the upper aerodigestive tract (res-

piration and swallow) from fetus through the lifespan; the impact of genetic and metabolic conditions on cognition, communication, and upper aerodigestive tract function; impact of diseases and disorders on cognition, communication, and upper aerodigestive tract function; and changes in clinical signs and symptoms, and how they might impact cognition, communication, and upper aerodigestive tract function. When the groups met following the delineation of those aspects needed to prepare the MSLP, there was consensus that the current organization and cousework offerings were either not a part of university training curricula, or that not all university settings were able to cover this amount of information in the typical two year master's program.

The group then talked about the kind of training mechanisms they felt would be appropriate in preparing the SLP to enter a medical setting. Some of the consensus that came from this discussion included: (1) professional training should not necessarily be confined to the master's level but should begin at the undergraduate level; (2) training should involve more cooperation between health service personnel and university faculty; (3) training should be more competency-based and more related to actual caseload characteristics; (4) defining future training needs would depend upon what clinicians need to know and do to meet client needs; and (5) practitioners may need to be multi-skilled and develop competencies based on their particular area of practice.

There was continued discussion about the need for an increased emphasis on undergraduate training requirements. In general, all attendees felt that training should start with increased chances for mandatory observation of clinical settings, observation of patient advocacy and support groups, interacting with master clinicians, serving as volunteers in a variety of hospital settings including nursing homes, and participation in community-based mentoring by either a master clinician or an appropriate graduate student. In order to improve undergraduate training it was recognized that there might be problems with individualized medically-based tracts at the undergraduate level. Such problems might include state educational requirements and/or the resistance of faculty to involve undergraduates in more clinically-oriented experiences.

There was a discussion of the types of models needed for increasing involvement of clinical training in academic programs. These included the use of the clinical grand rounds concept including the use of videotapes, case problem solving, telerounds, partnering of clinicians and faculty for team teaching in both settings, more extensive use of multidisciplinary staffing, and more across disciplinary observations such as in the departments of physical medicine, otolarlyngology, and neurology. There was a consensus that the curriculum for MSLP begin in the junior and senior years, extend through the two year master's and into the CFY experience.

There were a number of new models for teaching MSLPs that were discussed. These included: developing a resource network or mentoring through the SIDs; providing a referral network for clinical sabbaticals for faculty into medical settings; establishing clinical bulletin boards for Internet; more extensive use of consultation by satellite; encouraging mentorships with persons from other, but related, disciplines; availability of master clinicians for consultation by telephone; and finally, improving the CFY training program.

The CFY should be further developed to meet the needs of a medical setting by rotating the clinical fellow to various sites, for instance from acute care to rehabilitation to chronic care. There was discussion that the SID should contact large companies such as Nova Care to work with them to improve the CFY experience without additional costs. There needs to be a program for those clinicians who are working in a medical setting but who do not feel their academic or practical experience allows them to practice competently in that setting. It was discussed that sites offering a CFY should define competencies that could be expected to come from the CFY. CFY sites should provide universities a list of expected competencies that a master's level graduate should have before applying for a CFY in a medical setting.

The final day of the conference was spent in discussions of the future needs of those working in medical settings, the current demands for models of clinical practice and service delivery, and which models are cost effective. Suggested new models for clinical practice included: the use of SLP aides; expanded use of group therapy; increased family-centered therapy; satellite consultation; efforts to reduce the number of treatment sessions to achieve a desired outcome; self-practice labs with support personnel; distance assessment and treatment; and staging long-term intervention for chronic disorders. There was a recognized need to encourage clinical research. Suggestions were made to begin to use the SIDs to pair master clinicians with university faculty to conduct treatment outcome studies, seek foundation money for the development of cooperative studies of treatment, develop more collaborative relationships with vendors for support of outcome studies, encourage clinicians to develop research questions and then pair them with those with special research expertise who could assist with the design and implementation of the study and finally, increase our visibility as practitioners to those who are making healthcare decisions.

The conference attendees decided on two major paths of action: (1) to share the results of this meeting with appropriate ASHA committees such as the Council on Graduate Education, and (2) for each SID group involved in this meeting to develop a list of competencies needed to practice in a medical environment.

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Present and Future Trends in Graduate Education: A Summary of Comments Made on 2/26/96 at a Colloquium at the University of Florida, "Perspectives on the Future of Professional Education in Speech-Language Pathology"

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In looking at ongoing and anticipated changes in models of graduate education in the field of speech-language pathology (SLP), one must consider the traditional model of education which encompasses academics, clinical experience, and research. One must also look at the forces which have defined this traditional model over the last 80 years. It is important to be critical and objective in reviewing this traditional model as we answer the question, "Do we keep all three components of the traditional model of graduate education?" If the answer is "No," a second question is, "How do we justify to our colleges and deans the need for reform based on pressure from external forces?" Conversely, if we do keep all three components, we need to be asking ourselves, "How can we achieve a balance between the three primary areas of graduate education while meeting the needs and demands of today's workplace?" Historically, we only had to look within ourselves and examine the accreditation criteria for graduate programs in answering these questions. However, graduate programs across this country and Canada are beginning to accept the fact that the external forces which were trying to dictate changes in how we prepare professionals (but, for the most part, had failed to get our attention) now were getting the ears of our state and national legislators (Shadden, 1995). It is not only possible but probable that they are influencing the way higher education defines itself in terms of the traditional three-pronged mission of teaching, research, and service. Not only that, it is also likely that they are influencing the financial commitment that our lawmakers are willing to make to the ivory-towered educators who are perceived as costing the state money by refusing, according to the powerful lobbyists from the external forces, to keep up with the times (Davis, 1995).

In order for our professionals to stay competitive and competent in a wide range of medical and education work sites, those individuals who are charged with curriculum development in the universities must be cognizant of both internal and external demands from the medical-site practitioners and the education-site practitioners, the generalists and the specialists, the traditionalists and the reformers, the employers and the consumers. The internal/traditional forces which impact curriculum decisions in the academic, clinical, and research realms are only one focus of this paper. The second major focus is the call for changes in the traditional model of education from external forces, namely healthcare reform, public education reform, and reduced funding of higher education. Finally, questions and challenges which will prepare us to make needed changes in our model of professional education are presented.

In light of the internal force of the phenomenal growth in the number of undergraduates applying to graduate school, we need to pay particular attention to the criteria being used to accept students into a program, and should more carefully consider counseling students at the beginning of their education in this field to consider different tracks (research, clinical, academic). Students who declare SLP as a major and are beginning their course of study need to be told at the outset that, while there are many jobs available, the bridge between the undergraduate degree and practicing the profession is becoming more narrow due to the unprecedented growth in undergraduate programs across the country with no concomitant growth in graduate programs. Identification of the competencies and characteristics of successful clinicians is more important than ever due to the cost of advanced education, the proportional decrease in admissions to graduate programs, and the need to support all aspects of our profession. There are many professional skills that we can teach (interviewing, literature review, assessment and diagnosis, treatment strategies, problem solving and logical thinking), but there are also some critical clinical skills (common sense, maturity, initiative) which we cannot teach. Finally, there are professional skills (empathy, flexibility, leadership, compassion, innate knowledge, and loyalty) which are difficult to teach (Ripich & Wiley, 1994; Gelman, 1996). In many ways, the success of our profession lies in the careful selection of graduate students who are able to learn and use the "teachable" skills and who possess the "unteachable skills."

In addition to the internal forces, there are five major external forces which are driving change in our education programs: healthcare reform (including the Pew Health Professions Commission), public education reform (including major public school education reform initiatives and IDEA Reauthorization), changes in the accreditation of graduate education programs, reduced funding of higher education ("Do more with

Table 1. Internal and External Forces Affecting SLP Graduate Curriculum

COMPONENT	INTERNAL FORCES	EXTERNAL FORCES
ACADEMIC	Need to focus on science to encourage research attitudes and aptitudes at all degree levels (Holland, 1995) Need to provide additional instruction in multicultural issues Unprecedented growth in numbers of undergraduates majoring in SLP with no concomitant growth in the number of students that can be accommodated by graduate programs Funding cuts and constraints Must teach students the need and process of determining treatment efficacy (Frattali, Curl & Bevan, 1994; McNeill, 1995) Need to focus on service delivery issues, especially as pertains to schools	Need to focus on service delivery issues, especially as pertain to medical settings Need to include courses on augmentative communication and undergraduate courses focusing on communication disorders specific to children Need to have fewer courses; reduced funding, particularly for graduate education; reduced or same number of faculty in spite of increased numbers of students, particularly at the undergraduate level (which leads to decreased time teaching at the graduate level in order to cover the demands for undergraduate courses)
CLINICAL	Need to provide increasing opportunities to work in a variety of settings with a varied caseload At undergraduate level, teach basic science and introductory coursework Universities are having difficulty providing practicum for small to medium sized graduate programs; no university in Florida is claiming to be equipped to provide clinical practicum experience (beyond the 25 hours of observation) for 300+ undergraduate students per year Need to strengthen relationship between classroom and clinical education (*ASHA*, 1994a)	Schools: Need to provide more clinically focused disorder coursework at the undergraduate level, and practicum. Need to graduate with the BA/BS degree, ready to work Pew Commission: Train everyone at the lower/non-degree levels in "like tasks clusters" (*ASHA*, 1994b) Need to provide more clinical practice in education settings Need to provide more clinical practice in medical settings Need to learn the "business" of healthcare Need to learn medical writing skills Practicing clinicians are less willing and/or less able to provide practicum sites with adequate supervision Need to teach prevention and conservation (Goldstein, 1994) Need to address clinical licensure and accreditation issues at state and national levels
RESEARCH	Need more research, particularly clinical trials, treatment studies, and research addressing treatment efficacy Need to have undergraduate emphasis on research At all levels, need to teach research principles, research consumerism, and the profession's scientific basis Need better recruitment of doctoral students	Pressure from the State Legislature in Florida to do more teaching, particularly at the undergraduate level, and less research Reduced funding for research Need to produce more Ph.D.s who are going to maintain research as their primary focus (Holland, 1995)

less."), and reduced local, national, international, private, and public funding of research. Specifically, when exploring the impact of these external forces, the following questions merit consideration:

- What aspects of the traditional model of graduate education in SLP need to be retained, but modified?
- What innovative models of graduate education in SLP can be implemented, and how do we measure their effectiveness? Which of these models allow us to do more with less without compromising the philosophical and ethical foundations of our professional education?

• In preparing students for the workforce, how do we teach them to balance ethics, legalities, and issues related to best practices across all settings with all age groups with all disorders?

Table 1 provides a summary of the internal and external forces which affect how these questions are answered with regard to graduate (MA/MS) education for the remainder of this century.

One aspect of graduate education reform is actually an internal change due to external forces. In a rather dramatic change of policy, the American Speech-Language-Hearing Association (ASHA) has accepted a proposal by the Council on Professional Standards in SLP and Audiology to rescind the mandatory faculty to student ratio of 1:6. Universities that choose to have a higher faculty to student ratio must be able to demonstrate that the increased ratio does not compromise the ability of the program to maintain its quality of education, nor does it compromise its vision, its mission, or its goals and objectives (ASHA, 1995). In Florida, every university program has been approached by area school districts with regard to admitting full-time clinicians who are working in the schools with the bachelor's degree as part-time students. The change in policy with regard to the 1:6 ratio was due, in part, to a strong letter writing campaign from public school administrators nationwide, with the majority of the letters coming from Florida. The campaign was a reaction to the repetitive comment that graduate programs were not able to expand to accommodate more students (which in theory would decrease the shortage of SLPs in the public schools) because of the 1:6 ratio. While this change may permit universities to accept more graduate students, in reality the practicum demands are much more of an issue in determining how many students can be accepted than is the 1:6 ratio. A primary stumbling block for many BA/BS clinicians who are working as licensed/certified paraprofessionals or as speech-language clinicians in the schools is the inability to take time off from work to obtain the required practicum experience to complete a master's degree and apply for ASHA certification. Therefore, the issue of accruing ASHA clock hours for certification at one's place of employment is another concern which needs to be collaboratively addressed by school districts and universities. Universities must work cooperatively with local school districts through participation in education consortia, in-service training support, use of distance learning (Guilford, 1995), creative financing of supervision, and other proactive measures to decrease the shortage of qualified personnel in the public schools.

The final issue that merits consideration as we study the professional preparation of SLPs is actually a semantic issue, but it potentially can impact how we are perceived by other professionals. This issue centers around the differentiation of "training" versus "education": which one is being done, and which one should be done. We routinely speak about clinical training, but perhaps we need to be more cognizant of the definitions of being "educated" as opposed to being "trained." The infinitive "to train" is defined as "to make proficient by instruction and practice, as in some art, profession, or work" and "to be trained" is defined as "to undergo discipline and instruction, drill, etc." On the other hand, "education" is defined as "the act or process of imparting or acquiring general knowledge *and of developing the powers of reasoning and judgment*" (Urdang & Flexner, 1969). As we increase the use of support personnel in SLP, we should use the word "train" for the preparation of paraprofessionals, and use the word "educate" when describing the preparation of professionals since the professionals must understand the process instead of simply implementing the technique. This distinction takes on added importance when one considers the wording of healthcare reform issues which call for the on-the-job training of multi-skilled workers by employers following the attainment of a general liberal arts and sciences degree (ASHA, 1994b).

The Questions and the Challenge: Preparing for Change

At a 1994 ASHA Colloquy on Academic Preparation, Fred Spahr issued the following challenges to education programs at universities and colleges (Spahr, 1995):

• Develop and evaluate educational models complete with visions, goals and functional outcomes;

• "Reshape, recast, and redo their curricula": develop competency-based curricula which focus on the product, not the means;

• "Prepare school-based and health care professionals first and disciplinary experts second."; and

• Establish relevance of academic and clinical instruction to the workplace by

a. Instilling "science as a base for clinical practice," and

b. Improving "the teaching and advocacy skills of our faculties."

It is interesting to look at the parallel between the issues faced by those professionals involved in direct service delivery in a variety of work settings and those professionals whose primary work setting is in academia! Across settings, across disorders, across life spans, across specialties and subspecialties, many of the same issues are affecting service delivery: cost-effectiveness, functional outcomes, "doing more with less," personnel shortages, impact of internal forces, and impact of external forces. No matter where one is employed, an understanding of healthcare reform and public education reform is paramount. Therefore, it is critical that graduate curricula include discussion of the terminology associated with each area of reform and the implications and potential impact of each area of the SLP field.

At a time when our profession is calling for increased research, particularly in the areas of treatment efficacy as we try to answer the doubts of healthcare reformers, legislators and regents are asking for increased time in the classroom and less research. This certainly points to the need for additional emphasis on research "out in the field" by practicing clinicians and for additional curricular emphasis on clinical research. Vekoius (1995) states this issue very dramatically and effectively, saying "Universities traditionally have the obligation to examine, question, and develop new areas. Changing the health care delivery process to provide high quality services in a cost-effective manner deserves significant research effort. In fact, the future success of audiology and speech-language professionals lies in developing functional outcome measures and a solid database. Our viability as professions also depends on how well our students are prepared for service delivery in a new environment."

This paper has served as an introduction to the forces which are impacting changes in our profession and which have a

domino effect on graduate education. However, if changes are occurring due to internal or external forces, it is time for increased communication between those who have left the universities and moved on to work in a variety of settings and those of us who have chosen to have undergraduate and/or graduate education as our primary career focus. We ALL have an obligation to the profession, as described in the fourth principle of the ASHA Code of Ethics, to work for the betterment of the profession. ASHA has relied on the practicum/internship method of sending graduate students out into the community to learn aspects of the profession that relate to specific work settings. Inherent in this model has been the supervision of these students by those who are working at the site. All of us can look back and name at least one supervisor who instilled in us a love of the profession, and we frequently tend to model our own clinical and supervisory style after that influential individual. With the increasing lack of master's-level clinicians in the public schools, however, it is often difficult to find a school-based practicum for graduate students. With the growth of managed care, clinicians in medical settings often are faced with economic demands which inhibit their ability to be clinical educators. This, too, makes the perpetuation of the profession through the traditional reliance on practicum a tenuous foundation from which to continue to operate. Thus, we all must work together to determine the best way to educate students so that the profession, as we have known it, will continue to experience positive growth.

Perhaps the ultimate challenge in creating the needed reform in university programs dedicated to educating professional SLPs is to be sure that faculty members are aware of the external forces which are changing the settings in which our students are finding employment (Logemann, 1995). Although the prevailing ASHA policy still demands a curriculum which provides for "generalist" training of the master's-level student, there is an increased expectation among employers that graduates will be ready to function as independent professionals. The impact of these external forces combined with the internal forces affecting graduate education must be taken into account as we bring the academic, clinical, and research components of professional preparation into the future that is now.

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(Re)Training Practicing Clinicians: Clinical Education/ Clinical Competencies

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The purpose of my presentation today is to address issues surrounding the (re)training of practicing clinicians in the field of speech-language pathology. Four general aspects of (re)training issues will be addressed: (1) the need for (re)training; (2) the goals of (re)training; (3) models for (re)training; and (4) anticipated benefits.

Assessment and treatment of communicative-cognitive disorders, participating in radiographic evaluations, completing endoscopic evaluations of voice and swallowing functions, fitting and dispensing tracheoesophageal voice prostheses, evaluating the need for and training individuals in the use of computerized communication systems, developing communication and feeding strategies for ventilator dependent patients, treating premature infants in a neonatal intensive care unit...negotiating managed care contracts, developing clinical pathways, evaluating functional outcomes, supervising paraprofessionals, participating in medical-legal-ethical aspects of patient care. These and many other components of the daily clinical practice of speech-language pathology (SLP) were rare, if present at all, as recent as 10-15 years ago. Against this background of an exploding scope of practice is the observation that our profession is turning gray slowly (in professional terms) and some would say prematurely gray. The purpose of my presentation today is to address issues surrounding the (re)training of practicing clinicians in the field of speech-language pathology. Four general aspects of (re)training issues will be addressed: (1) the need for (re)training; (2) the goals of (re)training; (3) models for (re)training; and (4) anticipated benefits.

The Need for (Re)Training

In describing the average member of the American Speech-Language-Hearing Association (ASHA), the Omnibus Survey of 1990 stated "...the average member is 38.5 years of age and obtained their last degree in 1979...and has remained in that field ever since." In 1992 only 20% of all speech-language pathologists (SLPs) were under 35 years of age (Pannbacker, Middleton & Click, 1995) with many of these professionals returning to practice following a period of no active employment. These statements in combination with the rapid expansion of scope of practice strongly indicate the need for (re)training opportunities for the post-graduate professional.

Hand-in-hand with the expanding scope of practice in SLP is the question of the comprehensiveness of our professional (i.e. graduate) training programs. Professionals graduating with appropriate preparation to enter the workplace would be current with existing practice parameters and require less "professional maintenance" over the years following graduation. In general, ASHA members feel adequately prepared to enter clinical practice (81% of members surveyed in the 1990 Omnibus survey). Unfortunately, there is strong evidence that graduate training programs lag behind the demands of professional practice rather than set the standards for future practice. SLPs increasingly are working in the healthcare industry. Between 1990 and 1994 alone, an increase of over 5% of ASHA SLPs was noted in healthcare environments (33% to 38%: Keough, 1990; ASHA: March 1995). Furthermore, we are in the midst of a revolution of how healthcare, including speech-language services, is being provided. Yet, as recently as 1993, ASHA's Task Force on Health Care indicated that the second of 18 priorities was the need for changes in clinical and academic preparation of entry-level practitioners. A 1994 survey (Henri, 1994) of executive directors and clinical supervisors in community speech and hearing centers indicated that less than 20% of recent graduates were well prepared to enter that specific workforce area. None were rated as excellent with reference to preparedness, over 50% were rated as adequate, and less than 10% were rated as poor. There was a noted gap in preparedness ratings regarding pediatric versus adult areas of practice. Less than 10% of the recent graduates were considered prepared to engage in clinical practice with adults, while over 90% were felt to be prepared to work with children. Within specific disorder areas, child language and phonology were rated highest on the preparedness scale; aphasia and dysarthria were rated near the top but in the middle of the scale; and dysphagia, augmentative communication, and multicultural issues were rated among the lowest.

Results of a 1991 survey of SLP practicing clinicians in the state of Florida (Crary, 1992) paralleled the results of multiple ASHA surveys. 65% percent of the respondents felt that a master's degree "mostly prepared" them for clinical practice while only 4% felt poorly prepared. Still, a large discrepancy was noted among areas of clinical practice concerning degree of preparedness through master's-level education. These results were strikingly similar to the 1994 national survey. Clinicians felt best prepared to address developmental disorders, and least prepared to address dysphagia, augmentative communication and laryngectomy problems. The middle areas included adult

aphasia, fluency, and voice disorders. Respondents felt best prepared to enter the workforce in the public school system and least prepared to enter hospitals or private practice. Interestingly, the results indicated that changes in career direction most frequently went from the public school practice to healthcare practice. These results were not influenced by the amount of post-master's clinical experience. Clinicians trained within five years of the survey responded similarly to those trained 25 years prior to the survey.

Collectively then, we have at least three potentially inter-related issues to substantiate the need for (re)training of the practicing clinician: (1) the scope and environment of practice opportunities have expanded dramatically and continue to expand; (2) graduate education programs have not kept pace with rapid changes in the employment market; and (3) practicing professionals are "graying" and require mechanisms to keep up with changing practice trends or to change career directions. A major focus of this (re)training appears to be the explosion of employment opportunities within the healthcare field.

The Goals of (Re)Training

The goals of (re)training seem to be fairly overt from the preceding discussion. Practicing clinicians will benefit from mechanisms allowing them to acquire new clinical skills. These would be skills that either were not included in their graduate education and/or skills that have emerged since their graduate education. The opportunity to update existing skills with more recent information will be important. As our knowledge base evolves and expands, it will be important for practicing clinicians to keep abreast of recent developments. Additionally, (re)training opportunities should be available for those professionals re-entering the workforce after periods of professional inactivity. Finally, (re)training opportunities will facilitate change in work environments such as those who enter the healthcare environment from an education-based career.

An important issue to consider in developing (re)training options is whether the goal is to generally retrain the professional or to provide them with the opportunity to acquire specific skills. In short, are we proposing professional degrees (doctorates) to elevate the overall entry level of preparedness or are we proposing subspecialty certifications based on training and/or the demonstration of clinical competencies? This distinction speaks not only to the professional needs of the individual but also to the mechanism through which advanced training opportunities are to be offered.

Models for (Re)Training

Depending on the goals of the training opportunity, various mechanisms should be considered. If we intend to improve the preparedness of graduating professionals, we must look at mechanisms that can interface with existing graduate education practices. A 1994 report on graduate student preparation suggested that the "typical 2-year master's degree with its broad-based scientific and clinical education, may no longer be our most effective training vehicle." (Henri, 1994). Suggested alterations in traditional programs included increased clinical specialization during the master's program possibly by forming what I would refer to as *"professional training systems"* via collaborative arrangements with appropriate service providers. Since the explosive growth and a large portion of documented need are focused on healthcare provision, it is logical for academic training programs to establish meaningful collaborative relationships with healthcare systems to enhance the professional preparation of their graduates. While this is overtly attempted with clinical practica placements and more recently with internships as part of graduate training, few examples of integrated academic/clinical preparation exist.

Didactic/classroom training also may be applicable for certain practicing professionals wishing to add new information or simply to enhance existing information. A key feature here will be "accessibility." Innovative models of education delivery such as distance learning, weekend courses, or condensed institutes may be beneficial. A potential limitation of classroom learning in a clinical field is the limitation of hands-on experience. Unless didactic training is part of an advanced degree, it may be best suited as an introduction to information with consideration for subsequent demonstration of clinical competence.

Mentoring is a much discussed model for acquiring professional experience. Typically, a mentor provides one-on-one professional experience to a clinician/student in an advanced clinical environment. While this model may be advantageous for the acquisition of specific skills by individuals, it is less attractive for reaching large numbers of clinical practitioners.

Supervised clinical experience is a traditional model of clinical education in SLP. This model may interact well with didactic academic approaches to establish clinical competencies. It may be best suited for advanced professional degrees or for internships or clinical fellowship programs.

Continuing education activities currently are the most prevalent mechanisms for practicing clinicians to obtain (re)training. States requiring a professional license to practice typically require a minimum number of continuing education units (CEU) to renew/maintain the license. Also, national organizations such as the ANCDS who offer board certification require extensive continuing education activity to maintain board certification. While CEU activity may play an important role in a self-directed lifelong professional learning plan, few mechanisms are in place to address the cohesiveness of multiple CEU activities. Specifically, there are few, if any, models that allow the practitioner to accumulate related CEU experiences toward formal recognition of advanced skill. The ACE award presented by ASHA reflects cumulative CEU activity without indication for content or demonstrated clinical competency (e.g., exposure to information does not guarantee competent application of that information).

A strong argument may be made for crediting individual experience, especially in our current situation where professionals are engaging in certain practice activities in the absence of mechanisms that credit them for these activities. Perhaps a mechanism should be established in which clinicians could document the amount of experience and demonstrate clinical competency toward official recognition of a specific skill. This possibility, however, must consider the preparedness of the individual to garner that experience and some assessment of competent performance resulting from that experience.

Not unlike the question posed in reference to the goals of (re)training is the question regarding outcome of (re)training for practicing clinicians. If the goal of professional education/training is a professional degree, different models of training would be appropriate versus if the goal were the

acquisition of specialty certificates reflecting discrete skills. This is a complex issue. Professional degrees suggest a revision in our current education/training regimen indicating advanced entry level preparation. Specialty certification does not necessarily imply a change in our current approach to professional preparation, but offers practicing professionals the opportunity to acquire and demonstrate skills (i.e. competencies) in specific areas of clinical practice. Either of these models implicates an advanced level of training, and, hence, practice in the professional market.

General (Re)Training Issues—Infrastructure

To simply specify content of (re)training for practicing clinicians would be incomplete. Many additional issues must be addressed *a priori*. Is every clinician prepared to enter every training program? Is it not reasonable to specify prerequisites that professionals must meet prior to engaging in advanced training? Is our program of study going to be curriculum-based, competency-based, or both? Curriculum-based training may limit itself to acquisition of information through didactic avenues without demonstration of competent clinical application. Who will be the providers of advanced clinical information? University professors may be best suited for certain aspects, but may not be well suited to convey advanced clinical skills in subspecialty areas unless these individual have continually engaged in advanced clinical practice. Clinical practitioners may be in the process of learning themselves and be unprepared to assume the role of clinical teacher. It will be important to establish criteria to recognize who the teachers will be. How long will the training require? The term "weekend wonders" often is tossed about in reference to individuals who assume adequate acquisition of knowledge based on a single workshop. Medicine has a parallel in the phrase "see one, do one, teach one." Conversely, it is reasonable to require multiple years for a clinician to become competent in performance of an isolated clinical skill. Again, this issue overlaps with the goals issues. If a professional degree is our goal, a curriculum and practicum of extended duration seems more reasonable compared to a goal of discrete skill acquisition. Finally, which mechanisms will suffice to administer these efforts? Must we look to professional organizations at the national level, the state level? Will they be offered through existing university programs that meet existing accreditation standards, or will new mechanisms be opened to address specific needs? These are questions not posed lightly. Infrastructure is important.

Anticipated Benefits

If we are successful in separating need and goal issues, selecting one or more models of training, and developing a functional infrastructure, what are the functional outcomes that our profession can expect from its efforts? Logically, if we produce practicing clinicians with better clinical skills, quality of healthcare delivered to consumers will be enhanced. But, in today's market, quality of care often is considered in the context of cost of care. Advanced training implies increased cost. Increased cost to acquire training should equate to increased expectations for income in the job market. Hence, this cost ultimately is passed back to the consumer. One argument may be that enhanced quality of care actually is less costly than care provided at less efficient levels. This is a logical argument, but one which may require proof more than logic.

Tangible benefits may be encountered by the SLP. Expanded clinical skills may equate into expanded employment opportunities. Furthermore, clinicians who feel prepared to enter and stay in the workforce may receive more job satisfaction. The basic question may boil down to "can we provide clinical service better and cheaper and enjoy it more?"

Concluding Comments

My intention in this presentation was to focus on certain issues that relate to advanced training options for the practicing clinician. The issues surrounding needs, goals, models, and benefits are not mutually exclusive. Do we need to change the entry level for clinical practice? Many would say "yes" and with good reason. Are there other models that can be instituted that would offer advanced training to practicing clinicians? The answer is "of course." Our goals must be discussed and made clear as we consider the form and content of the practice of SLP in the future. One conclusion may be that (re)training starts in the existing graduate programs. Recognition of the potential need for specialization at the graduate level and development of mechanisms to realize that potential would result in a better "product" entering the workforce following these programs. With a better prepared professional entering the workforce initially, maintenance of existing skills and acquisition of new skills may be less difficult. Part of this specialization is the strengthening of a bond between the classroom and the clinic. Perhaps by evaluating professional training at its beginning point, we can take the (re) out of (re)training.

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The Role and Practice of Clinical Specialty Recognition in the Future Training of Speech-Language Pathologists and Audiologists

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I have been a practicing clinician in speech-language pathology (SLP) for over 20 years and have specifically focused my clinical practice on neurologic communication disorders by exclusively working in acute and chronic healthcare settings. As such, I have had numerous opportunities to work with clinicians newly entering the field, either as practicum students completing their final moments before entry into the Clinical Fellowship Year or as clinicians engaged in their Clinical Fellowship Year. These sets of experiences led me to the personally held perspective that I had not been prepared by my graduate education to enter my area of clinical practice and that the new clinicians that I have worked with were not adequately prepared either. About the time I was coming to this conclusion, I read a questionnaire study of speech-language pathologists (SLPs) by Waller and Murphy (1983) that confirmed my suspicion in that of 531 respondents actively working in their first year of practice in healthcare settings, 62% reported that they were "inadequately" or "poorly" prepared for the demands of their clinical activities and 40% said that they had *never directly worked with an aphasic patient prior to their employment in a hospital setting!* At the same time that I was becoming concerned about this notion, changes were occurring in SLP, especially those found in healthcare settings, regarding our scope and risk liability. For example, it was during this period that the scope of practice of SLP was expanded to include the diagnosis and management of swallowing disorders (see reference list for this and other documents from the American Speech-Language-Hearing Association (ASHA) regarding the changing scope for both SLPs and audiologists), which represented not only a new area of practice that at the time was not routinely taught in our graduate programs (and still is not) but also one which represented a practice of significantly higher risk than previously experienced. Each time that ASHA confirmed the expansion of the scope of practice of SLP or audiology, they included a disclaimer that clinical preparation for entry into clinical practice (as currently defined) was not sufficient for preparation to enter into these newly expanded practice areas, and the professional who was interested would need to get training beyond that given to enter the field. Collectively this led me to conclude that our entry level practitioners (immediately post CCC) entering the healthcare setting were (and are) not prepared to practice in this setting by their educational experiences.

What solutions to this problem are there for us? First, some have suggested that what is provided in the upper class years of undergraduate program needs to be redesigned for "content tracking" allowing earlier identification of those students who ultimately want to practice in healthcare settings, earlier placement in courses relevant to this specific area of practice, and lessened exposure to topic areas not directly subsumed within this area of practice (which ultimately may allow more opportunity for exposure to expanded and specified topic areas). A second suggested solution is the possibility of including these expanded topic areas into the curriculum at the graduate level but the discussion typically falls to whether to do this by lengthening an already hefty graduate curriculum or specialty tracking (with the exclusion of non-specialty specific courses) in the master's program. All of these suggestions meet with valid criticisms and the result is no solution but a perpetuation of the identified problem.

Ultimately, the perspective most deserving of protection and defense from ill-prepared practitioners is that of the consumer of those clinical services which, in the case of healthcare practice, is the patient, family or caregivers. What has been done to assist patients in obtaining the services of a professional that is best prepared to meet their unique needs? It is with this challenge that ASHA developed and approved (and is currently implementing) a program of specialty recognition for SLPs or audiologists. Specifically, in 1994 the ASHA Clinical Specialty Board (CSB) was formed to accept applications from *groups of interested practitioners* to approve recognition programs within specialty practice areas that they may represent. Their task as a petitioning group is to define the *population and in turn the current clinical practice area* they believe requires clinical knowledge that is specialized in content and that exceeds the basic preparation currently provided for entry into the practice of SLP or audiology. Thus, the definition of areas of specialization are driven by consumer need and not guided by notions within the professional organization of ASHA. If a petitioning group does successfully defend the practice area of specialization, they then

develop a program for review and approval by the ASHA CSB that is designed to confirm that the necessary knowledge and skills for independent practice in the clinical area are, in fact, achieved by an applicant. If the CSB approves such a plan, a commission is formed to administer each program of specialization (see Figure 1) and individual practitioners seeking recognition may then apply to their respective commission for specialty recognition. All programs of specialty recognition will require ASHA clinical certification, post-certification experience relevant to the specialty area, a mechanism for assessment of knowledge in the specialty area, and a renewal mechanism (to be determined by each commission).

While each specialty area will determine its own specifications suited to their unique area, some attributes of the educational programming and clinical training relevant to all can be identified. First, all experiential and educational accomplishments must be documentable and standardizable within an area of specialty. Second, all relevant experiences (educational and practical) must be beyond that required for the ASHA Certificate of Clinical Competence (CCC). Finally, all requirements must be clinically relevant and clinically based. Therefore, the question asked of me for this symposium was what is the "role" and "practice" of clinical specialty recognition in the future training of SLPs and audiologists? For training at the level of entry into the practice of SLP or audiology, the answer would be that at this point there is no role or practice for clinical specialty recognition as it is clearly stated as intended to relate to points in practice much later in the clinicians' development and only for those clinicians interested in specialized preparation. But in the case of the "role" and "practice" of specialty recognition in the training of SLPs or audiologists in preparation for advanced, specialized practices, the picture is quite different. This represents a new frontier and clearly a currently unmet challenge to educators and specialized clinicians alike to better communicate with one another for the sake of those with communication disorders that are uniquely demanding. In the current healthcare funding environment, the call is to provide more efficient care to patients. For medicine, that involves encouraging a proportionately higher amount of clinical effort expended by less expensive clinical providers than has been

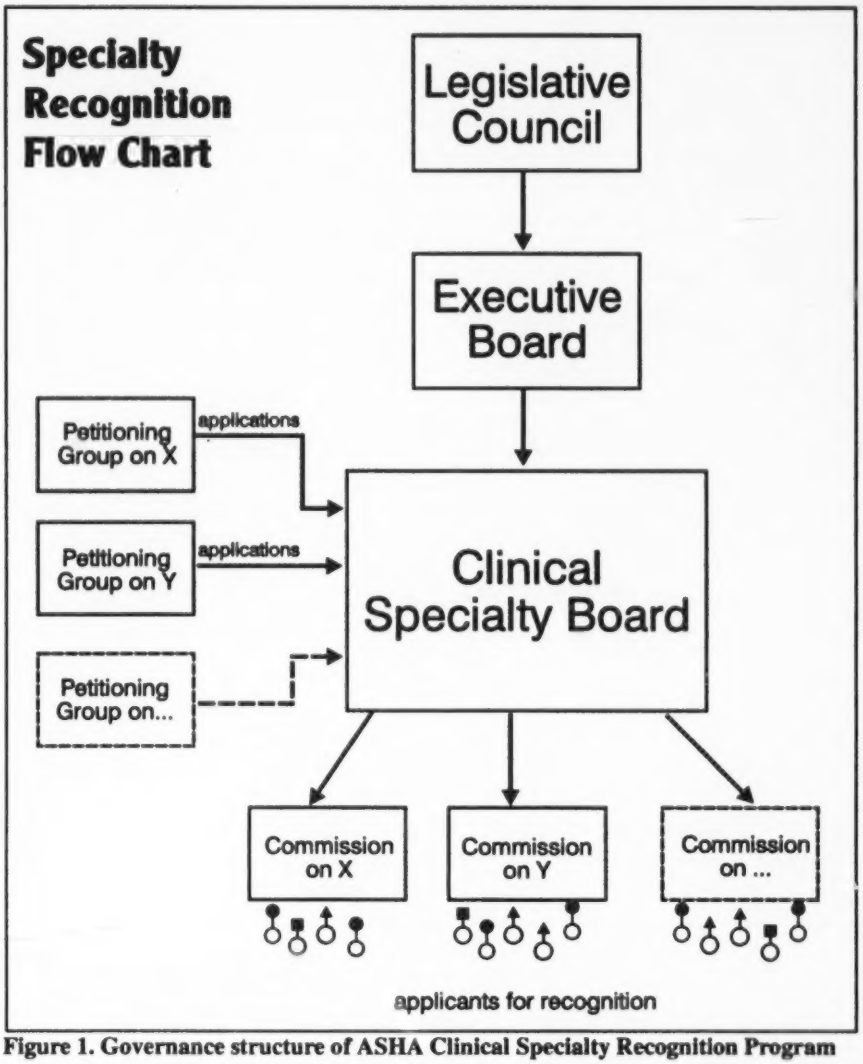

Figure 1. Governance structure of ASHA Clinical Specialty Recognition Program

provided in the past. With estimates of specialization in medicine approaching 75+%, the challenge is to redistribute their workforce to a proportionately greater number of general providers compared to specialized providers. However, it is clear that this does not mean completely abolishing all specialty care; simply utilizing this expensive care only when the need cannot be handled by less expensive forms of intervention. Clearly, there is recognition even in a capitated system that there are times when specialized care is warranted and even most cost/benefit efficient. In contrast, we in speech-language pathology and audiology currently operate in healthcare systems with a workforce that is recognized as 100% general provided. No one is currently identified as able to provide specialized care. Therefore, in our currently changing healthcare system, our challenge is to develop a proportion of our workforce as specialized providers. This is the challenge of the developing specialty recognition program and is the new frontier for future programming within our educational institutions. What is a least clear to me is that if our educational institutions take up this challenge, a compatible change in their mission will need to occur as this challenge is deeply embedded within active clinical practice and must be taught within clinical settings by those who are themselves actively and routinely participating in specialized clinical care.

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